SELECTED WATER RESOURCES ABSTRACTS

VOLUME 4, NUMBER 12
JUNE 15, 1971

W71-05836 -- W71-06455

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information will now be provided by NTIS.

SELECTED WATER RESOURCES ABSTRACTS is available to Federal agencies, contractors, or grantees in water resources upon request to: Manager, Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior, Washington, D. C. 20240.

SELECTED WATER RESOURCES ABSTRACTS is also available on subscription from the National Technical Information Service. Annual subscription is $22 (domestic), $27.50 (foreign), single copy price $3. Certain documents abstracted in this journal can be purchased from the NTIS at prices indicated in the entry. Prepayment is required.

SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 4, NUMBER 12
JUNE 15, 1971

W71-05836 -- W71-06455

Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus** (November 1966 edition). Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency, Water Quality Office. A directory of the Centers appears on inside back cover.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

FOREWORD

CONTENTS

FOREWORD_____iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

A. Properties

RAPHIC DISSOLVED OXYGEN COMPUTA-ON,
ontana State Univ., Bozeman.
eal Dixon.
vil Engineering, Vol 41, No 3, p 60, March 1971.
, 1 fig.

escriptors: *Dissolved oxygen, *Dissolved oxygen alyzers, Methodology, Charts, Water quality, ater analysis, Surface waters, Salinity, At-ospheric pressure, Water temperature, Dissolved lids.
entifiers: *Dissolved oxygen nomograph.

convenient graph for dissolved oxygen computa-ns was devised by coupling the chart with a nograph relating dissolved oxygen concentra-n, saturation concentration, percent saturation, d percent deficit. This provides a rapid means of nverting dissolved oxygen concentrations in mil-rams per liter to percent saturation or deficit at y altitude, temperature, and dissolved solids con-ntration. (Woodard-USGS)
71-06121

B. Aqueous Solutions and Suspensions

DIUM, MAGNESIUM, AND CALCIUM LFATE ION-PAIRS IN SEAWATER AT 25C,
regon State Univ., Corvallis. Dept. of Oceanog-phy.
r primary bibliographic entry see Field 02K.
71-06166

FFECT OF TEMPERATURE ON THE pH OF EAWATER,
el Univ. (West Germany). Institut fuer eereskunde.
r primary bibliographic entry see Field 02K.
71-06167

2. WATER CYCLE

A. General

ULTIVARIATE TECHNIQUES FOR SPECIFY-G TREE-GROWTH AND CLIMATE RELA-ONSHIPS AND FOR RECONSTRUCTING NOMALIES IN PALEOCLIMATE,
rizona Univ., Tucson. Tree-Ring Research Lab.; d Wisconsin Univ., Madison. Climatic Research enter; and Virginia Univ., Charlottesville. Dept. Environmental Science.
r primary bibliographic entry see Field 02B.
71-05851

EPORT ON BIOLOGICAL, CHEMICAL, AND EOLOGICAL STUDIES OF BOIS BRULE AND OPLAR RIVER WATERSHEDS,
isconsin State Univ., Superior. Center for Lake perior Environmental Studies.
r primary bibliographic entry see Field 05C.
71-05986

ACIFIC OCEAN INFLUENCE UPON ALIFORNIA RAINFALL,
lifornia Univ., Los Angeles. Water Resources enter.
r primary bibliographic entry see Field 02B.
71-06115

HYDROLOGIC ANALYSIS OF THE NEW RSEY PINE BARRENS REGION,
ological Survey, Trenton, N. J.
ward C. Rhodehamel.
New Jersey Division of Water Policy and Supply Water Resources Circular No 22, 1970. 35 p, 2 fig, 2 tab, 34 ref.

Descriptors: *Water resources, *Hydrology, *Hydrologic data, *Hydrologic aspects, *New Jersey, Surface waters, Groundwater, Precipitation (Atmospheric), Runoff, Streamflow, Aquifers, Aquifer characteristics, Water yield, Water balance, Specific capacity, Hydrologic budget, Water quality, Chemical analysis, Data collections, Evapotranspiration, Geology, Vegetation, Topography.
Identifiers: *Pine Barrens region (NJ).

Resources of the Pine Barrens region of south-central New Jersey (2,250 sq. mi. region in the Atlantic Coastal Plain underlain by the Cohansey Sand) is summarized. The long-term hydrologic budget can be stated as P—R..ET where: P, the average annual precipitation is 45 inches; R, the average annual stream runoff is 22.5 inches; and ET, the average annual evapotranspiration is 22.5 inches. Average annual evapotranspiration losses which total 2.41 bgd can be divided into: (1) interception losses--0.63 bgd, (2) evapotranspiration for undrained depressions--0.09 bgd, and (3) evapotranspiration from soil and groundwater--1.69 bgd. Average annual stream runoff which totals 2.41 bgd can be divided into (1) direct runoff--0.27 bgd and (2) base runoff or groundwater runoff--2.14 bgd. The flow of water within the regional flow system is calculated to be 70 mgd, or about 0.7 inch of water per year. Both ground and surface waters contain objectionable amounts of iron and at times color, and the pH values are in the acidic range. However, because of the low concentrations of total dissolved solids (25-50 mg/liter) treatment of the water for iron removal and pH adjustments will provide a water supply suitable for most purposes. (Woodard-USGS)
W71-06125

WESTERN SNOW CONFERENCE.
For primary bibliographic entry see Field 02C.
W71-06133

LABORATORY SIMULATION OF SNOWMELT,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02C.
W71-06139

SIMULATING SNOWMELT HYDROGRAPHS FOR THE FRASER RIVER SYSTEM,
British Columbia Univ., Vancouver. Dept. of Civil Engineering; and British Columbia Univ., Vancouver. Water Resources Group.
A. Pipes, M. C. Quick, and S. O. Russell.
Proceedings 38th Annual Meeting of Western Snow Conference, April 21-23, 1970, Victoria, British Columbia, Canada: Printed by Colorado State Univ, Fort Collins, p 91-97, 1970. 7 p, 4 fig, 4 ref.

Descriptors: *Simulation analysis, *Mathematical models, *Rainfall-runoff relationships, *Snowmelt, Synthetic hydrology, Evapotranspiration, Precipitation (Atmospheric), Heat budget, Topography, Temperature, Snow, Snowpacks, Streamflow forecasting, Water yield, Runoff forecasting.
Identifiers: *Runoff synthesis, Fraser River (B C).

The long term goal of a study at the University of British Columbia is to develop a simulation model of the Fraser River system for research and teaching purposes. The model can be used to estimate the consequences of storage reservoirs in the river system and simulate discharge from readily available meteorological data for purposes of flood forecasting and evaluating the impact of critical meteorological patterns. The study consists of two main phases: simulation of discharge from relatively small basins and routing of flows down the river channels. Techniques which are being used are described in the paper. (See also W71-06133) (Knapp-USGS)
W71-06147

THE AUTOMATIC HYDROLOGICAL RADIO REPORTING NETWORK, NEW ENGLAND DIVISION, CORPS OF ENGINEERS,
Office of the Chief of Engineers (Army), Washington, D.C. Civil Works Directorate.
For primary bibliographic entry see Field 07A.
W71-06149

2B. Precipitation

MULTIVARIATE TECHNIQUES FOR SPECIFYING TREE-GROWTH AND CLIMATE RELATIONSHIPS AND FOR RECONSTRUCTING ANOMALIES IN PALEOCLIMATE,
Arizona Univ., Tucson. Tree-Ring Research Lab.; and Wisconsin Univ., Madison. Climatic Research Center; and Virginia Univ., Charlottesville. Dept. of Environmental Science.
Harold C. Fritts, Terence J. Blasing, Bruce P. Hayden, and John E. Kutzbach.
Final Contract Report for Department of Commerce, Environmental Science Services Administration - Weather Bureau, November 9, 1970. 48 p, 14 fig, 2 tab, 29 ref. ESSA Contract E-41-70 (N).

Descriptors: *Dendrochronology, *Paleoclimatology, Dating, Climatology, Ecology, Forests, Growth rates, Trees, Hydrology, Hydrogeology, Statistical methods, Regression analysis, Paleohydrology.
Identifiers: *Dendroclimatology.

Ring widths from trees on certain sites reflect climatic variation. Therefore, long time series derived from replicated and precisely dated ring-width chronologies may be utilized to extend climatic records into prehistoric times. Multivariate analyses of tree-ring chronologies from western North America are used to derive response functions from which one can ascertain what climatic information each ring-width chronology contains. In addition, multivariate analyses are utilized to calibrate a large number of ring-width chronologies of diverse response functions and from widely dispersed sites with a large number of regional climatic variables. A series of transfer functions are derived which allow estimates of anomalous climatic variation from tree-ring records. Reconstructions of anomalous variation in atmospheric circulation for portions of the northern hemisphere back to A.D. 1700 are obtained by applying the transfer functions to tree-ring data for time periods when ring data are available but climatic data are not. (Knapp-USGS)
W71-05851

PACIFIC OCEAN INFLUENCE UPON CALIFORNIA RAINFALL,
California Univ., Los Angeles. Water Resources Center.
Jacob Bjerknes, and Charles B. Pyke.
Available from NTIS as PB-198 126, $3.00 in paper copy, $0.95 in microfiche. California University Water Resources Center Technical Completion Report W-254, November 30, 1970. 15 p, 10 fig. OWRR Project A-021-CAL (3).

Descriptors: *Climatology, *Synoptic analysis, Meteorology, Survey, Weather patterns, Air masses, Precipitation (Atmospheric), Storms, Weather, Rainfall.
Identifiers: *Western North America.

The climatic patterns of precipitation in the western United States and Baja California were examined in considerable detail. Of particular concern are the three prominent seasonal precipitation maxima: the winter maximum which occurs in all coastal and most interior sections, the summer maximum in the interior deserts of the southwestern United States and in Baja California, and the late spring maximum in the interior of the Pacific Northwest United States. The winter precipitation maximum is associated with extratropical cyclones of the north Pacific Ocean; and in the mean this maximum progresses generally southward along the west coast of the United States

with time, occurring in early December in northwestern Washington and in mid-February in portions of coastal southern California. This southward progression appears to be related to the general southward displacement of the mean upper tropospheric jet stream and the associated north Pacific storm track during the late fall and winter. The warm-season rainfall maxima which are observed in the interior portions of the western United States and Baja California appear to result primarily from convective activity occurring within warm, unstable air masses. (Knapp-USGS)
W71-06115

OPPORTUNITIES FOR MODIFYING WEATHER TO AUGMENT PRECIPITATION AND SUPPRESS HAIL,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 03B.
W71-06132

THE SURFACE INSTRUMENT NETWORK OF THE UPPER COLORADO RIVER PILOT PROJECT,
Western Scientific Services, Inc., Fort Collins, Colo.
For primary bibliographic entry see Field 07A.
W71-06136

THE AUTOMATIC HYDROLOGICAL RADIO REPORTING NETWORK, NEW ENGLAND DIVISION, CORPS OF ENGINEERS,
Office of the Chief of Engineers (Army), Washington, D.C. Civil Works Directorate.
For primary bibliographic entry see Field 07A.
W71-06149

DENSE NETWORK FOR RAPID MEASUREMENT OF RAINFALL RATE,
R. A. Semplak, and H. E. Keller.
Bell System Tech J, Vol 48, No 6, p 1745-1756, Jul-Aug 1969.

Descriptors: *Rain gages, *Design, *Data collections, *Rainfall disposition, *Instrumentation, *Measurement.

The design and operation of a dense rain gage system for obtaining statistical data on both the temporal and spatial distribution of heavy rainfall are discussed. This rain gage is a continuous, flow type with a response time of the order of one second. The system used for recording data on a magnetic tape is described, and typical computer-generated rain maps for large area storms and for localized showers are given.
W71-06410

2C. Snow, Ice, and Frost

FORMATION OF THE THERMAL REGIME IN SOILS ON IRRIGATED FIELDS IN PERMAFROST REGIONS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Yakutsk (USSR).
For primary bibliographic entry see Field 02G.
W71-06070

WESTERN SNOW CONFERENCE.

For sale by Western Snow Conference, Mr. Robert T. Davis, Secretary, Rm. 360, United States Courthouse, Spokane, Wash. 99201 - Price $3.00.
Proceedings 38th Annual Meeting of Western Snow Conference, April 21-23, 1970, Victoria, British Columbia, Canada: Printed by Colorado State Univ, Fort Collins, 1970. 107 p.

Descriptors: *Snowpacks, *Snowmelt, *Water yield, *Data collections, *Conferences, Telemetry, Data processing, Mathematical models, Digital computers, Streamflow forecasting, Runoff forecasting, Water management (Applied).
Identifiers: *Western Snow Conference.

This publication reports the available papers and formal discussions presented at the Thirty-Eighth Annual Meeting of the Western Snow Conference. The Conference convened in Victoria, British Columbia, on April 21-23, 1970. Topics discussed include snow management, snowpack instrumentation and telemetry, simulation of snowmelt runoff, snow loads (structural), streamflow forecasting, and automated flood warnings. (See also W71-06134 thru W71-06149) (Knapp-USGS)
W71-06133

SNOW AND RESERVOIR MANAGEMENT IN CANADA FOR THE COLUMBIA RIVER TREATY OPERATION,
British Columbia Hydro and Power Authority, Vancouver, Canada, Hydrology Branch.
W. H. Fisher, and U. Sporns.
Proceedings 38th Annual Meeting of Western Snow Conference, April 21-23, 1970, Victoria, British Columbia, Canada: Printed by Colorado State Univ, Fort Collins, p 1-6, 1970. 6 p, 3 fig, 5 ref.

Descriptors: *Reservoir operation, *International commissions, *International Joint Commission, *Columbia River, *Snow management, Runoff forecasting, Hydroelectric power, Snow surveys, Water conservation, Probability, Water storage.
Identifiers: *Columbia River Treaty.

Management of Columbia River Treaty storage reservoirs in Canada to increase hydroelectric power generation and flood control in the United States and Canada is described. Water management criteria are presented, consisting of operating rules, seasonal run-off forecasting procedures and short-term streamflow forecasting methods. The criteria, primarily derived by empirical methods, attempt to optimize the storage operation. Draft of the storage is governed by power generation requirements and seasonal run-off forecasts; refill of the storage is governed by seasonal run-off forecasts, short-term forecasts and power generation requirements. The seasonal run-off forecasts consider combined winter precipitation and snowpack water equivalent, spring and summer precipitation, antecedent precipitation and mean monthly maximum temperatures of the forecast period. Glacier melt is considered in the Mica drainage basin. (See also W71-06133) (Knapp-USGS)
W71-06134

THE DEVELOPMENT AND APPLICATION OF A HYDROLOGIC MODEL AS AN OPERATIONAL TOOL,
Sierra Hydrotechnology, Placerville, Calif., and California Cooperative Snow Surveys, Sacramento. Dept. of Water Resources.
Jack F. Hannaford, Richard H. Bush, and Raymond E. Barsch.
Proceedings 38th Annual Meeting of Western Snow Conference, April 21-23, 1970, Victoria, British Columbia, Canada: Printed by Colorado State Univ, Fort Collins, p 7-15, 1970. 9 p, 5 fig, 1 tab.

Descriptors: *Snowmelt, *Runoff forecasting, *Mathematical models, *California, Streamflow forecasting, Rainfall-runoff relationships, Hydrograph analysis, Base flow, Recession curves, Storm runoff, Operations research, Systems analysis, Flood forecasting.
Identifiers: *Kings River (Calif), San Joaquin Valley (Calif).

A runoff simulation technique was originally prepared for use on the American River and then applied to operational problems on the Kings River watershed during the record snowmelt runoff and floods of 1969. Hydrologic concepts and processes were modeled, basic data were collected to achieve simulation of these processes, and characteris of the watershed are described. The mode technique was used as a management tool to vide basic information for making operational d sions in the Kings River watershed during 19 (See also W71-06133) (Knapp-USGS)
W71-06135

DENSITIES OF PRAIRIE SNOWPACKS,
Saskatchewan Univ., Saskatoon. Dept. of Agri tural Engineering; and Saskatchewan Un Saskatoon. Dept. of Civil Engineering.
Don M. Gray, D. I. Norum, and G. E. Dyck.
Proceedings 38th Annual Meeting of West Snow Conference, April 21-23, 1970, Victo British Columbia, Canada: Printed by Color State Univ, Fort Collins, p 24-30, 1970. 7 p, 4 fi tab, 4 ref.

Descriptors: *Snowpacks, *Water equival *Grasslands, *Density, *Water storage, Den stratification, Instrumentation, Nuclear moist meters, Water yield, Snow surveys.
Identifiers: *Prairie snowpacks.

During the winters of 1968 and 1969, several dies were undertaken related to snow in the hig exposed Prairie Environment. The average den (during December-March) of freshly-fallen sn was approximately 0.045. Freshly-fallen snow r increase in density to a value of approximately 0 within 24 hours after the fall of the snow. This d sity is approximately equal to the average den which the pack maintains during the wi months. Water equivalent estimates may be m from measured depths using an assumed densit 0.23. A two probe gamma radiation apparatus modified so that the source and detector travel rate of 15 inches per minute through the sn profile. When repeated measurements of a sin profile were made the mean deviation in densi for point readings throughout the profile 0.023. The difference between the average de ties for the entire pack, on repeated measureme was approximately 0.005. Measurements made a notched plastic block show that the systen capable of accurately detecting changes in den due to layering, if the layers are greater than inch thick. (See also W71-06133) (Knapp-USG W71-06137

LABORATORY SIMULATION OF SNOWME
British Columbia Univ., Vancouver. Dept. of C Engineering.
Michael C. Quick.
Supported by British Columbia Disaster Re Fund. Proceedings 38th Annual Meeting Western Snow Conference, April 21-23, 1970, V toria, British Columbia, Canada: Printed Colorado State Univ, Fort Collins, p 37-43, 197 p, 7 fig, 3 ref.

Descriptors: *Snowmelt, *Model studies, *Wi *Laboratory tests, Heat budget, Turbulence, M ing, Advection, Convection, Heat transfer, Albe Solar radiation.
Identifiers: *Wind tunnels, *Snowmelt simulatio

Snowmelt is the major input to high flow runo the Fraser River system, and it is necessary to h good understanding of factors effecting snowm before an adequate flow forecasting system ca constructed. To study the basic physics of sn melt, a type of low speed wind tunnel was bui which temperature, humidity and radiation ca controlled, and melt rates of samples of snow be measured. Results of some of these experim are presented and the validity of such small s tests to the calculation of, melt rates in the la scale natural situations is discussed. (See also W 06133) (Knapp-USGS)
W71-06139

VARIATION OF GROUND SNOW LOADS BRITISH COLUMBIA,
National Research Council of Canada, Ott (Ontario). Div. of Building Research.

A. Schaerer.
roceedings 38th Annual Meeting of Western
now Conference, April 21-23, 1970, Victoria,
ritish Columbia, Canada: Printed by Colorado
tate Univ, Fort Collins, p 44-48, 1970. 5 p, 4 fig, 9
ef.

escriptors: *Snowpacks, *Density, *Loads
Forces), Ice loads, Load distribution, Weight,
esign, Design criteria, Building codes, Snow sur-
eys, Data collections, Sampling, Topography, Al-
tude.
lentifiers: *British Columbia, *Snow loads.

he snow load used for the design of buildings va-
es with geographical location, elevation and
spect. In 1966 observations were initiated to ob-
in information on the variation with elevation in
ritish Columbia. This water equivalent of the
now on the ground was measured at sites having a
tandard exposure and at 400 feet intervals of
levation on several mountains. The maximum
now load per winter is a second degree function of
he elevation. Snowloads increase at a greater rate
wet climate than in areas where snowfalls are
nall. (See also W71-06133) (Knapp-USGS)
/71-06140

EVELOPMENT OF SNOW LOAD DESIGN
ATA FOR THE UNITED STATES,
nvironmental Data Service, Silver Spring, Md.
. C. S. Thom.
roceedings 38th Annual Meeting of Western
now Conference, April 21-23, 1970, Victoria,
ritish Columbia, Canada: Printed by Colorado
tate Univ, Fort Collins, p 49-51, 1970. 3 p, 1 fig, 8
ef.

escriptors: *Snowpacks, *Density, *Loads
Forces), Ice loads, Load distribution, Weight,
esign, Design criteria, Building codes, Snow sur-
eys, Data collections, Sampling, Topography, Al-
tude.
lentifiers: *Snow loads.

or development of snow load data for Standard A-
8 of the U.S.A. Standards Institute, it was decided
hat the best basis for snow load should be observa-
on of actual weight of snow (water equivalent) in
reference to the depth of snow multiplied by the
ensity. Since structures must withstand the ex-
eme load in any year, the annual extreme value
istribution of water equivalent on the ground is
eing employed. High elevation loads are a particu-
r problem and work looking toward solution of
is problem is discussed. Results on conversion
om ground to roof and the effect of roof configu-
ation are reviewed. (See also W71-06133) (K-
app-USGS)
/71-06141

N APPROACH TO SNOW LOAD EVALUA-
ION,
hn Webster Brown, Inc., Reno, Nev.
hn Webster Brown.
roceedings 38th Annual Meeting of Western
now Conference, April 21-23, 1970, Victoria,
ritish Columbia, Canada: Printed by Colorado
ate Univ, Fort Collins, p 52-60, 1970. 9 p, 4
ate, 2 ref, 1 tab, append.

escriptors: *Snowpacks, *Density, *Loads
Forces), Ice loads, Load distribution, Weight,
esign, Design criteria, Building codes, Snow sur-
ys, Data collections, Sampling, Topography, Al-
ude.
entifiers: *Snow loads.

he development of the 1964 Washoe County,
evada, Snow Load Code is presented. Com-
arison is made with the 1965 National Building
de of Canada, together with comments indicat-
g the general applicability of same to other re-
ons. A general method of evaluating snow load
lues is outlined, including consideration of recur-
nce interval. Recommendations for additional
ow courses in urbanizing mountainous areas for
rrelation to longer term stations are set forth.
ee also W71-06133) (Knapp-USGS)
W71-06142

SNOW LOADS FOR THE DESIGN OF ROOFS IN CANADA,
National Research Council of Canada (Ottawa). Div. of Building Research.
For primary bibliographic entry see Field 08A.
W71-06143

SNOW COURSE WEIGHTING PROCEDURE,
British Columbia Water Resources Service, Vancouver. Hydrology Div.
For primary bibliographic entry see Field 07C.
W71-06146

SIMULATING SNOWMELT HYDROGRAPHS FOR THE FRASER RIVER SYSTEM,
British Columbia Univ., Vancouver. Dept. of Civil Engineering; and British Columbia Univ., Vancouver. Water Resources Group.
For primary bibliographic entry see Field 02A.
W71-06147

SNOW SURVEY TELEMETRY NETWORKS AND FUTURE PLANS,
Soil Conservation Service, Anchorage, Alaska. Water Supply Forecasting Branch; and Soil Conservation Service, Anchorage, Alaska. Snow Survey for Alaska.
For primary bibliographic entry see Field 07A.
W71-06148

2D. Evaporation and Transpiration

ESTIMATES OF MONTHLY EVAPORATION LOSSES FROM THE GREAT LAKES 1950 TO 1968 BASED ON THE MASS TRANSFER TECHNIQUE,
Department of Transport, Toronto (Ontario). Meteorological Branch.
T. L. Richards, and J. G. Irbe.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 469-487, 1969. 19 p, 4 fig, 11 tab, 18 ref.

Descriptors: *Evaporation, *Great Lakes, *Mass transfer, Meteorology, Surveys, Water temperature, Reviews, Weather, Data collections, Meteorological data.
Identifiers: *Canada.

The Meteorological Service of Canada estimates, at the end of each month, the monthly evaporation losses from each of the Great Lakes bordering on Canada. These estimates are based on the mass transfer technique, using modified wind and vapor pressure data from shoreline climatological stations, and surface water temperature data from airborne radiation thermometer flights and ships' surveys. This paper presents a brief review of the technique and provides a record of monthly evaporation losses from each of the Lakes over a relatively long period. (See also W71-05561) (Knapp-USGS)
W71-05892

WATER CONSERVATION BY REMOVAL OF PHREATOPHYTES,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 03B.
W71-06154

2E. Streamflow and Runoff

FLAT-VEE WEIRS IN ALLUVIAL CHANNELS,
Hydraulics Research Station, Wallingford (England).
For primary bibliographic entry see Field 08B.
W71-05849

EFFICIENCY OF HYDRAULIC JUMP,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
For primary bibliographic entry see Field 08B.
W71-05850

WATER RESOURCES OF THE HEBER-KAMAS-PARK CITY AREA, NORTH-CENTRAL UTAH,
Geological Survey, Salt Lake City, Utah.
C. H. Baker, Jr., and D. L. Peterson.
Utah Department of Natural Resources, Division of Water Rights, Technical Publication No 27, 1970. 79 p, 23 fig, 7 tab, 40 ref, append.

Descriptors: *Water resources, *Utah, Surface waters, Groundwater, Hydrologic budget, Streamflow, Aquifers, Water wells, Alluvium, Hydrogeology, Gravity studies, Data collections, Water quality, Hydrologic data, Hot springs.
Identifiers: Heber (Utah).

The Heber-Kamas-Park City area encompasses about 810 square miles in Wasatch and Summit Counties, in north-central Utah, and includes four mountain valleys--Heber Valley, Rhodes Valley, Parleys Park, and Round Valley--with most of the surrounding watersheds. On the boundary of the study area the average annual discharge of the Provo River for the 14-year period 1953-67 was 256,300 acre-feet per year. The average discharge of the Weber River was 110,000 acre-feet per year. The consolidated rocks of the Wasatch Range and Uinta Mountains contain large quantities of groundwater, mostly in fractures and solution openings, and numerous springs discharge water from the consolidated rocks. Most wells yield only small supplies of water from the consolidated rocks. The primary permeability of the rocks is low, and wells can produce large yields only if they intersect fractures and solution openings. Most of the wells in the area derive water from the unconsolidated alluvial fill in the four valleys. The aquifer characteristics of the unconsolidated material in the four valleys are generally similar. The transmissivity ranges from 6,700 to 20,000 cubic feet per day per foot in Heber Valley and probably is less in the other valleys. The specific yield is estimated to be 12-15 percent. In Heber Valley the average annual recharge and discharge is calculated as about 86,000 acre-feet of water. An estimated 280,000 acre-feet of water could be recovered by dewatering the upper 100 feet of the aquifer in the unconsolidated deposits in Heber Valley, 310,000 acre-feet could be recovered by dewatering the upper 100 feet in Rhodes Valley, and about 80,000 acre-feet could be recovered by dewatering the unconsolidated deposits in Parleys Park. The water is of good quality for most uses. (Knapp-USGS)
W71-05852

SUMMARY OF DATA ON TEMPERATURE OF STREAMS IN NORTH CAROLINA, 1943-67,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-05855

WATER-RESOURCES APPRAISAL OF THE COLUMBUS SALT MARSH-SODA SPRING VALLEY AREA, MINERAL AND ESMERALDA COUNTIES, NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 04B.
W71-05862

ON UNIFORM FLOW THROUGH SMOOTH RECTANGULAR OPEN CHANNELS,
Connecticut Univ., Storrs. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 08B.
W71-05863

WATER RESOURCES OF THE BLACK RIVER BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.

W71-05869

DIFFUSION FROM A CONTINUOUS SOURCE IN A UNIFORM SHEAR FLOW,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 05B.
W71-05872

HORIZONTAL TRANSPORT IN A ROTATING BASIN OF PARABOLIC DEPTH PROFILE,
Northwestern Univ., Evanston, Ill.
G. E. Birchfield.
Journal of Geophysical Research, Vol 72, No 24, p 6155-6163, December 15, 1967. 9 p, 3 fig, 5 ref. NSF Grant GP-3659.

Descriptors: *Rotational flow, *Flow profiles, *Surface waters, *Currents (Water), *Mathematical models, Basins, Rotations, Vortices, Eddies, Stress, Surface tension, Viscosity, Volocity, Depth, Boundaries (Surfaces), Mathematical studies, Equations, Diversion, Water circulation.
Identifiers: Horizontal transport (Water currents).

Horizontal transports in a rotating parabolic basin are found for three elementary steady stress fields. For a uniform stress, the circulation consists of two vortices so arranged that the inshore transport is more or less in the direction of the surface stress, with a return flow in the interior. For a stress with constant curl, the interior transport is a large symmetric vortex, with possibly a weak countercurrent near the shore; for a stress with constant divergence a weak vortex occurs in the interior, with weak countercurrents occurring near shore. For a combined surface stress, the transport in the interior is dominated by the curl component; near shore the uniform stress component may be equally important. (Woodard-USGS)
W71-05903

WIND-DRIVEN CURRENTS IN A LONG ROTATING CHANNEL,
Northwestern Univ., Evanston, Ill. Technological Inst.
G. E. Birchfield.
Tellus, Vol 19, No 2, p 243-249, 1967. 7 p, 1 fig, 1 tab. NSF Grant GP-3659.

Descriptors: *Currents (Water), *Surface waters, *Channel flow, *Model studies, Winds, Wind velocity, Boundaries (Surfaces), Rotational flow, Channel morphology, Stress, Water circulation, Mathematical studies, Equations, Steady flow, Surface tension, Flow profiles, Viscosity, Flow rates.
Identifiers: *Wind-driven water currents.

Boundary-layer type solutions are obtained for currents generated in a homogeneous fluid in a long rotating channel by a steady wind stress acting along or across the channel. Included are viscous wall boundary layers which arise necessarily from secondary circulations transverse to the axis of the channel, and from no-slip conditions at the wall. In order to satisfactorily incorporate the vertical structure a very simple model is used. Since the wind stress is assumed independent of the coordinate along the channel, the motions are also assumed two dimensional, with the one exception that a constant pressure gradient along the channel is permitted as a special case. The horizontal scale is such that the rotation of the channel may be taken as a constant; the fluid is homogeneous. The currents produced by the constant pressure gradient along the channel represent a counterclockwise circulation. A case of special interest is that of uniform stress along the channel. (Woodard-USGS)
W71-05904

STABILITY OF ROCK SLOPES--GRAPHICAL METHODS,
Coyne et Bellier, Paris (France).
P. Londe, G. Vigier, and R. Vormeringer.
Proc Amer Soc Civ Eng, J Soil Mech Found Div, Vol 96, No SM4, p 1411-1434, July 1970. 24 p, 14 fig, 1 tab, 9 ref, 3 append.

Descriptors: Rock mechanics, *Rocks, Sliding, *Slope stability, Soil mechanics, *Stability analysis, *Graphical analysis, Diagrams, Dams, Abutments, Computer programs, Safety factors, Shear strength, Uplift pressure, Equilibrium, Analytical techniques, Methodology, Mapping, Foreign design practices, *Rock slope stability, *In situ rock.
Identifiers: France.

Three practical procedures for constructing simple diagrams for 3-dimensional study of rock slope stability are proposed. The diagrams show simultaneously all possibilities of limit equilibrium of a tetrahedral rock volume and allow detection and appreciation of the main problems of stability. In most cases, a glance at the diagram reveals the vital parameters that should be checked by measurement or controlled by special arrangements of design. Geometrical methods (stereographic or central projection of figures drawn on a sphere) or calculations made by electronic computer can be used for diagram construction. Analysis of an arch dam abutment by diagrams constructed using each of the 3 methods is presented. (USBR)
W71-05909

EXTRAPOLATION OF HISTORICAL STORM DATA FOR ESTIMATING DESIGN-WAVE HEIGHTS,
Chevron Oil Field Research Co., La Habra, Calif.
For primary bibliographic entry see Field 07C.
W71-06123

FLOODS FROM SMALL DRAINAGE AREAS IN CALIFORNIA-A COMPILATION OF PEAK DATA OCTOBER 1958 TO SEPTEMBER 1969,
Geological Survey, Menlo Park, Calif., Water Resources Div.
For primary bibliographic entry see Field 07C.
W71-06127

A PROPOSED STREAMFLOW-DATA PROGRAM FOR NEBRASKA,
Geological Survey, Lincoln, Neb.
For primary bibliographic entry see Field 07A.
W71-06128

THE DESCHUTES RIVER HYDROGRAPH FORECAST,
Soil Conservation Service, Portland, Oreg.
For primary bibliographic entry see Field 04A.
W71-06144

PRELIMINARY REPORT ON THE WATER RESOURCES OF THE WAILUKU AREA,
Geological Survey, Honolulu, Hawaii.
George Yamanaga, and C. J. Huxel, Jr.
Hawaii Division of Water and Land Development Circular C61, December 1970. 43 p, 9 fig, 7 tab, 9 ref.

Descriptors: *Water resources, *Groundwater, *Surface waters, *Hawaii, Evaluation, Hydrologic data, Data collections, Aquifers, Geology, Streamflow, Runoff, Water yield, Water quality, Aquifer characteristics, Rainfall, Water resources development, Withdrawal, Consumptive use, Specific capacity.
Identifiers: *Maui (Hawaii).

The occurrence of groundwater and surface water in the Wailuku, Hawaii area and what is known of the quantity and quality of water available for development is summarized. The area studied is about 75 square miles and is mainly the part of the Wailuki District which lies in West Maui. Drainage basins range in character from the dry gulches south of Waikapu to the deep valleys between Waikapu and Waihee. All perennial streams in the area except Makamakaole Stream derive their bas flows from water draining from high-level, dik held groundwater bodies lying within the We Maui Mountain. The largest sources of water ar the Waihee River and Iao Stream. Waikapu an Waiehu Streams also supply significant amounts water for irrigation. Groundwater occurs as hig level, dike-held water within the mountain mass, as basal water and as perched water. The mo promising source of additional water for use durin drought periods apperas to be a basla-water body the area between Waikapu and Waihee Valley (Woodard-USGS)
W71-06155

HYDROLOGIC INVENTORY OF THE UTA LAKE DRAINAGE AREA,
Utah Water Research Lab., Logan.
M. Leon Hyatt, Gaylord U. Skogerboe, Frank W. Haws, and Lloyd H. Austin.
Report PR WG 40-3, Utah Water Researc Laboratory, November 1969. 138 p. 60 fig, 43 tab 45 ref.

Descriptors: *Hydrologic data, *Hydrologi budget, *Water utilization, *Utah, *Maps, Histor Economics, Geology, Streamflow, Groundwate Water quality, Data collections, Regional analyses
Identifiers: *Utah Lake, *State water plans.

To facilitate the development of statewide plan water development for Utah, this comprehensiv report describing the Utah Lake Drainage Are was undertaken. This area, also called the Upp Jordan Hydrologic Basin is located in north-centra Utah. The physiography, topography, geology an profiles of stream beds are discussed or dia grammed. Basic data are tabulated, includin precipitation, temperature, streamflow, historica runoff, principal groundwater basins, consumptiv use, water quality information, water transporta tion, and water storage. The area is divided int eighteen subareas, and water budget diagrams an analyses are presented for each subarea as well as budget for the entire area. The principal use water in the Utah Lake Drainage area is for agricul ture; and beef- and dairy-cattle production, and th raising of small grains and alfalfa, are the most im portant agricultural uses. This report is supple mented with many detailed figures and tables (Yensen-Arizona)
W71-06218

HYDROLOGIC INVENTORY OF THE UINTA STUDY UNIT,
Utah Water Research Lab., Logan.
Lloyd H. Austin, and Gaylord V. Skogerboe.
Report PRWG 40-5, Utah Water Research Labora tory, March 1970. 182 p. 126 fig, 84 tab, 65 ref.

Descriptors: *Hydrologic data, *Utah, *Hydrologi budget, *Maps, *Water utilization, Region analyses, Data collections, Water quality, Ground water, Streamflow, Economics, Geology, Histor Water policy, Water resources development.
Identifiers: *Uintah Basin, *Green River, *Stat water plans.

The Uintah Basin hydrologic area is a large distric in the north-eastern corner of Utah. Of gre economic importance is the oil-bearing shale of th Green River Formation. However, agriculture the greatest water-consumer, the most importa agricultural products being beef, alfalfa, wool, an dairy products. This report was undertaken facilitate development of a comprehensive sta water plan. The geology, history, economy, and cl mate are outlined, and the various formations a fecting groundwater flow and storage ar discussed. Basic data concerning temperatur precipitation, streamflow, consumptive use, an water quality are tabulated. Annual and monthl water budgets for the fifty-six subareas ar presented and analyzed. Many maps, tables, an figures supplement and document this repor (Yensen-Arizona)
W71-06219

HYDROLOGIC INVENTORY OF THE WEBER RIVER STUDY UNIT,
Utah Water Research Lab., Logan.
Frank W. Haws, Roland W. Jeppson, and A. Leon Huber.
Available from Utah Water Research Laboratory, Logan, Utah $2.50. Report PRWG 40-6, Utah Water Research Laboratory, August 1970. 131 p. 37 fig, 39 tab, 56 ref.

Descriptors: *Hydrologic data, *Utah, *Hydrologic budget, *Maps, *Water utilization, Data collections, Water quality, Groundwater, Streamflow, Regional analyses, Economics, History, Geology, Water policy, Water resources development.
Identifiers: *Weber River, *State water plans.

This report was undertaken as part of an effort to compile a hydrologic inventory of the state, to be used in developing a comprehensive water plan for the state of Utah. The Weber River Study Unit is located in this area. Alfalfa, grain, corn, and orchard crops are grown. Basic features of the geology, history, economy, and climate are outlined. Information on temperature, precipitation, streamflow, water quality, and groundwater has been collected and tabulated. Monthly and annual water budgets for each of the nine subareas of this region are given and analyzed, along with a summary of the water budget program. Many figures, maps, and tables supplement this report. (Yensen-Arizona)
W71-06220

STATISTICAL SUMMARIES OF NEW JERSEY STREAMFLOW RECORDS,
Geological Survey, Trenton, N.J.
For primary bibliographic entry see Field 07C.
W71-06228

YORK RIVER BASIN COMPREHENSIVE WATER RESOURCES PLAN, VOLUME III-HYDROLOGIC ANALYSIS,
Virginia Dept. of Conservation and Economic Development, Richmond. Div. of Water Resources.
For primary bibliographic entry see Field 06B.
W71-06231

SIMULATION OF RUNOFF FROM URBAN WATERSHEDS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 04C.
W71-06306

2F. Groundwater

HYDROLOGY OF LIMESTONE TERRANES, PHOTOGEOLOGIC INVESTIGATIONS,
Geological Survey of Alabama University.
John L. Sonderegger.
Available from NTIS as PB-198 043, $3.00 in paper copy, $0.95 in microfiche. Alabama Geological Survey Bulletin 94, Part C, 1970. 27 p, 9 fig, 5 plate, 33 ref. OWRR Project B-007-ALA (4).

Descriptors: *Hydrogeology, *Remote sensing, *Carbonate rocks, *Aerial photography, *Alabama, Karst, Aquifers, Fractures (Geology), Surveys, Terrain analysis, Groundwater movement, Porosity, Permeability, Infrared radiation.
Identifiers: Limestone County (Ala).

Panchromatic, color, and infrared films were used to locate fracture traces as an aid to the interpretation of the occurrence and movement of groundwater in a limestone area in Alabama. Air photography using color and infrared films resulted in greater interpreter confidence and showed correlation with geologic structure. Wells drilled along fracture traces yielded substantially more water than the average of the randomly located wells. The thickness of the residuum had no noticeable control over the fracture-trace concentration. Previous models explaining the relationship between fracture traces and solution activity dealt with a single homogeneous limestone aquifer. In this area, two limestone aquifers separated by an aquiclude produce two different lithologic units on which solutional features that are reflected by fracture traces are developed. (Knapp-USGS)
W71-05838

WATER RESOURCES OF THE HEBER-KAMAS-PARK CITY AREA, NORTH-CENTRAL UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 02E.
W71-05852

GROUNDWATER RESOURCES OF THE LOYSVILLE AND MIFFLINTOWN QUADRANGLES IN SOUTH-CENTRAL PENNSYLVANIA,
Geological Survey, Harrisburg, Pa. Water Resources Div.
For primary bibliographic entry see Field 04B.
W71-05853

GEOCHEMICAL SURVEY OF MISSOURI, PLANS AND PROGRESS FOR SECOND SIX-MONTH PERIOD (JANUARY-JUNE, 1970).
Geological Survey, Denver, Colo. Regional Geochemistry Branch.
For primary bibliographic entry see Field 02K.
W71-05854

WATER-RESOURCES APPRAISAL OF THE COLUMBUS SALT MARSH-SODA SPRING VALLEY AREA, MINERAL AND ESMERALDA COUNTIES, NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 04B.
W71-05862

WATER RESOURCES OF THE BLACK RIVER BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-05869

RECONNAISSANCE INVESTIGATION OF THE SUBSIDENCE OF VENICE AND SUGGESTED STEPS TOWARD ITS CONTROL,
Geological Survey, Sacramento, Calif.
J. F. Poland, and L. J. Mostertman.
United Nations Educational Scientific and Cultural Organization Report, Paris, 1969. 24 p, 10 fig, 1 tab.

Descriptors: *Land subsidence, *Subsidence, *Withdrawal, *Aquifers, Water levels, Reviews, Surveys, Alluvium, Coastal plains, Islands, Beaches, Groundwater, Water table.
Identifiers: *Venice (Italy).

The main cause for the recent increase of the rate of subsidence of Venice (Italy) is the withdrawal of groundwater from the aquifers in the Venetian plain. In order to investigate further the nature, rate and causes of the subsidence and in order to identify which strata contribute to this phenomenon a program of geophysical surveys and drillings, followed by field tests and laboratory analysis, is proposed. These investigations are recommended to be conducted in such a way that they also furnish data necessary for study of the feasibility of remedial measures. A system of collection of available data and the use of a mathematical model are also recommended. Immediate legislative action to control groundwater discharge is considered to be necessary. (Knapp-USGS)
W71-05870

GROUNDWATER RECONNAISSANCE OF THE GREEN RIVER BASIN, SOUTHWESTERN WYOMING,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-05902

COMPUTER METHODS FOR TRANSIENT ANALYSIS OF WATER-TABLE AQUIFERS,
Ohio State Univ., Columbus. Water Resources Center.
George S. Taylor, and James N. Luthin.
Available from NTIS as PB-198 051, $3.00 in paper copy, $0.95 in microfiche. Ohio Water Resources Center Project Completion Report No 331X, January 12, 1971. 21 p, 4 fig, 11 ref. OWRR Project B-006-OHIO (2).

Descriptors: *Aquifers, *Drawdown, *Numerical analysis, Drainage, Zone of saturation, Hydraulic gradient, Pumping, Groundwater, Boundary processes, Wells, Seepage, Computer.
Identifiers: *Unconfined aquifer, Pumped wells, Vertical flow, Seepage surface, Free surface, Finite difference method.

The purpose is to present methods for utilizing numerical analysis and computer operations to solve problems of drawdown around a pumped well in an unconfined aquifer. The procedure is that of solving the basic flow equations for specified boundary conditions. The method takes into account the properties of the unsaturated portion of the aquifer and the contributions of vertical flow. The computer can give simultaneous solutions for flow in the saturated and unsaturated zone. The surface of seepage can also be included in the analysis. Although this report deals with flow into wells, the procedure is applicable to a variety of water flow problems. (Rackoff-Ohio State)
W71-05920

SEVENTH BIENNIAL CONFERENCE ON GROUNDWATER (PROGRESS, PRACTICE, AND POTENTIAL OF GROUNDWATER RECHARGE, DEVELOPMENT AND MANAGEMENT).
For primary bibliographic entry see Field 04B.
W71-06117

VENICE IS SINKING INTO THE SEA,
Electroconsult, Milan (Italy).
Carlo Berghinz.
Civil Engineering, Vol 41, No 3, p 67-71, March 1971. 5 p, 1 map, 3 photo, 2 tab.

Descriptors: *Land subsidence, *Submergence, *Tidal waters, *Cities, *Floods, Groundwater, Drawdown, Industries, Construction, Lagoons, Planning, Evaluation, Canals, Buildings.
Identifiers: *Venice (Italy).

Venice, Italy was founded 1,400 years ago on low land in the middle of a shallow lagoon 35 miles long and 6 miles wide. Today, storm surges of water frequently flood the low-lying city, damaging her historic buildings. What is worse, the city is subsiding, largely due to groundwater drawdown and nearby industrial construction. Sea barriers have been proposed; they would create a new problem because Venice has no sewerage system and so up to now needs the tidal flush. As interim steps, the city's artesian wells are being progressively closed, and no oil or gas drilling is permitted. Many more steps must be taken to save the city. (Woodard-USGS)
W71-06120

TURBULENT DISPERSION IN POROUS MATERIALS AS MODELED BY A MIXING CELL WITH STAGNANT ZONE,
California State Coll., Long Beach; and California Univ., Los Angeles.
C. R. Kyle, and R. L. Perrine.
Society of Petroleum Engineers Journal, Vol 11, No 1, p 57-62, March 1971. 6 p, 3 fig, 14 ref.

Descriptors: *Dispersion, *Mixing, *Porous media, *Turbulent flow, Groundwater movement, Mathematical models, Theoretical analysis, Diffusion, Turbulence.
Identifiers: *Turbulent dispersion.

A simple theoretical analysis is given of dispersion in rapid flow through porous materials. The analytical model considers a pore structure which acts like a sequence of mixing cells, each coupled with a stagnant zone. Computed results compare very favorably with experimental observations on flow through a staggered matrix of cylinders. This flow is shown to behave like packed beds of spheres with corresponding properties. Agreement requires that values for some theoretical parameters be fitted from the data. The values required for these parameters are reasonable. Development of this approach could be useful for a number of related problems. (Knapp-USGS)
W71-06122

SAFE YIELD OF AQUIFERS: AN ECONOMIC REFORMULATION,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 06B.
W71-06126

PENETRATION IN A GRADED FILTER,
Missouri Univ., Rolla. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W71-06151

GEOHYDROLOGY OF THE AREA NEAR WOSCO EXPLORATORY HOLE NUMBER 1, UINTAH COUNTY, UTAH,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 08H.
W71-06153

PRELIMINARY REPORT ON THE WATER RESOURCES OF THE WAILUKU AREA,
Geological Survey, Honolulu, Hawaii.
For primary bibliographic entry see Field 02E.
W71-06155

GROUNDWATER RESOURCES OF NELSON COUNTY, NORTHEASTERN NORTH DAKOTA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-06160

AVAILABILITY OF GROUNDWATER IN CHARLES COUNTY, MARYLAND,
Maryland Geological Survey, Baltimore.
Turbit H. Slaughter, E. G. Otton, and Charles P. Laughlin.
Maryland Geological Survey Bulletin 30, 1968. 100 p, 31 fig, 14 tab, 23 ref.

Descriptors: *Water resources development, *Groundwater, *Maryland, Water supply, Water yield, Water wells, Water quality, Groundwater movement, Aquifers, Urbanization, Hydrogeology, Hydrologic data, Data collections.
Identifiers: *Charles County (Md).

Charles County covers an area of 457 square miles of Maryland. On the average it receives about 46 inches of precipitation. The average annual temperature is about 56 degrees F. The estimated use of groundwater during 1962 was about 3.8 mgd. The largest single user of groundwater was the U. S. Naval Propellant Plant at Indian Head. The county is underlain by a wedge-shaped mass of sedimentary strata ranging in thickness from 600 to 2,000 feet. Several important aquifers are present throughout the county; based on rough estimates, these aquifers may be capable of yielding at least 55 mgd to properly spaced drilled and dug wells. About 3 mgd of groundwater can be obtained in the area of lowest economic and population growth potential and 16 mgd in the area of greatest potential. However, proper management of the groundwater resource will be necessary. The Waldorf area in the north-central part of the county appears to be most favorable for the development of large additional supplies. The chemical quality of the groundwater is satisfactory for most uses, although, locally, treatment for iron removal may be required. (Knapp-USGS)
W71-06168

AVAILABILITY OF GROUNDWATER IN DECATUR COUNTY, IOWA,
Geological Survey, Iowa City, Iowa.
J. W. Cagle, and W. L. Steinhilber.
Iowa Geological Survey Water Atlas No 2, 1967. 27 p, 9 fig, 3 tab.

Descriptors: *Water resources, *Groundwater, *Hydrologic data, *Data collections, *Iowa, Geology, Aquifers, Water wells, Drill holes, Water quality, Water yield, Chemical analysis, Hydrogeology, Water levels, Water sources, Pumping.
Identifiers: *Well data, *Test holes, *Decatur County (Iowa).

Groundwater information is presented to help solve the supply problems of some water users in Decatur County, Iowa. The information includes the location, definition, and estimated potential yields of the water-bearing materials in the unconsolidated deposits and the uppermost bedrock; an evaluation of the general occurrence and availability of water from bedrock sources; and a determination of the chemical quality of water from groundwater sources. Decatur County has an area of 530 sq mi and, according to the 1960 census, has a population of 10,539. About 55% of the population live on farms or in small communities where the water supply is obtained from private wells, ponds and cisterns. The remainder of the residents live in towns that have municipal water systems. Small-to-moderate supplies of water are available for development from the unconsolidated deposits in the county. Yields of several hundred gpm per well can be obtained from the deeper bedrock strata at about 2,600 to 2,700 feet in depth. Bedrock strata of shallower depths are capable of yielding 80 to 100 gpm per well. (Woodard-USGS)
W71-06175

SEEPAGE FACE EFFECTS IN UNSTEADY GROUNDWATER FLOW,
Wisconsin Univ., Madison. Water Resources Center; and Wisconsin Univ., Madison. Dept. of Civil Engineering.
Willard A. Murray.
Ph D Thesis. Wisconsin Water Resources Center, Madison, 1970. 143 p, 21 fig, 10 tab, 56 ref. OWRR Project B-021-WIS (1).

Descriptors: *Seepage, *Free surface, *Dimensional analysis, *Aquifer, *Ditches, Streams, *Flow, Water table, Drawdown, Groundwater.
Identifiers: *Saturated region, Fourier Analysis, Outflow face.

This study deals with the effect of the seepage face on the location of the free surface in a two-dimensional unconfined aquifer adjacent to a ditch or stream. The analysis is restricted to considering flow only in the saturated region below the water table; unsaturated flow effects are neglected. Theoretical solutions were obtained for steady state conditions and for the transient case of instantaneous drawdown by using potential theory and standard Fourier methods. The steady state solution is a corrected form of that presented by Kirkham (1964), which was found to contain a flaw. The transient solution involves a simple extention of the steady state solution and reduces to the latter for large time. Both solutions are presented in infinite series form. For the steady state, theoretical results indicate that the simple Dupuit parabola will give entirely satisfactory predictions of free surface locations for moderate drawdowns. For the transient case, the derived solutions indicate that the seepage face length decays exponentially. Furthermore, the transient solution including the effect of the seepage face shows a marked difference from the simplified potential solution in which the seepage face effect is neglected, particularly for small times and for locations near the outflow face. Experiments were conducted using a Hele-Shaw viscous flow model to verify the theoretical predictions.
W71-06190

WELL RECORDS, DEPTH-TO-WATER MEASUREMENTS, CHEMICAL ANALYSES OF GROUND WATER, DRILLERS LOGS, AND ELECTRIC-LOG INFORMATION IN HEMPSTEAD, LAFAYETTE, LITTLE RIVER, MILLER, AND NEVADA COUNTIES, ARKANSAS,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 04B.
W71-06229

ARTIFICIAL RECHARGE PRACTICES IN HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 04B.
W71-06263

AN ECONOMIC ANALYSIS OF THE INTERTEMPORAL ALLOCATION OF GROUNDWATER IN THE CENTRAL OGALLALA FORMATION,
Oklahoma State Univ., Dept. of Agricultural Economics.
For primary bibliographic entry see Field 04B.
W71-06266

2G. Water in Soils

UREA CONVERSION TO AMMONIA IN WATERLOGGED SOILS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 02K.
W71-05866

EFFECT OF FEEDLOT LAGOON WATER ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF SOILS,
Kansas State Univ., Manhattan. Dept. of Agronomy, and Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05C.
W71-05974

INFRARED PHOTOS CAN MAP SOILS,
Nebraska Univ., Lincoln. Agricultural Experiment Station.
For primary bibliographic entry see Field 07B.
W71-06058

HOW TO SELECT AND APPLY ZINC FERTILIZER,
Nebraska Univ., Lincoln. Agricultural Experiment Station.
For primary bibliographic entry see Field 03F.
W71-06059

DEGRADATION OF WATER QUALITY IN IRRIGATION RETURN FLOWS,
Robert S. Kerr Water Research Center, Ada, Okla. and Oklahoma State Univ., Stillwater. Dept. of Agronomy.
For primary bibliographic entry see Field 03F.
W71-06063

FORMATION OF THE THERMAL REGIME IN SOILS ON IRRIGATED FIELDS IN PERMAFROST REGIONS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Yakutsk (USSR).
Ye. P. Galymamin.
Trans from Pochvovedenie, Vol 12, 1968. Soviet Soil Science, Vol 12, p 1623-1627. 3 tab, 2 fig, 15 ref.

Descriptors: *Permafrost, *Plant growth regulators, *Heat flow, *Soil moisture, *Soil-water-plant relationships, Regulation, Arid lands, Irrigated land, Thermal conductivity, Crop production, Growth rates, Water demand, Nutrients, Potatoes

egetable crops, Stabilization, Water management Applied), Farm management, Chernozem, easonal, Thawing, Temperature, Fourier analysis, aplaces equation.
lentifiers: Field conditions, Heat-conductivity uation, Yakutsk (U.S.S.R.), U.S.S.R., Irrigation atus, Irrigated crops.

rop yields, plant growth and development are termined by thermal-, water-, and nutrient-soil gimes. Thermal-regime study is important to ops, especially in permafrost regions. Potato- and her vegetable-irrigation studies on Meadow-hernozem soil near Yakutsk indicate that per-afrost underlies a thawed layer in warm seasons. he main parameters are heat flow, thawing and mperature regime. The Fourier heat-conductivity uation is applied to field conditions. Soil oisture, or irrigation status, effect the Fourier ariables. Irrigation is an effective way of regulat-g thermal regimes, as to provides soil moisture nd temperature stability. Results of 4 other Rus-an studies are outlined. (Popkin - Arizona)
W71-06070

THE INFLUENCE OF VARIOUS SOIL MOISTURE-REGIMES ON THE YIELD AND QUALITY OF COTTON IN AN ARID ZONE,
National and Univ. Inst. of Agriculture, Rehovoth Israel). Volcani Inst. of Agriculture Research.
For primary bibliographic entry see Field 03F.
W71-06217

THE MECHANISM OF DIRECT RUNOFF FROM RAINFALL,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
James E. Garton.
Available from NTIS as PB-198 234, $3.00 in paper copy, $0.95 in microfiche. Completion Report, Oklahoma Water Resources Research Institute, Stillwater, (1970). 20 p, 5 tab, 4 fig, 8 ref, append. OWRR Project A-006 OKLA (2).

Descriptors: *Overland flow, *Mannings equation, *Uniform flow, Simulation analysis, Synthetic hydrology, *Flow resistance, Flow rates, Flow, Hydraulics.
Identifiers: *Simulated vegetation.

Information is sparse on the retardance of flow through upright stems of vegetation. Studies were conducted on a smooth flume in which cylindrical retardance elements were inserted at various regular spacings. The effects of pattern of spacing, diameter of elements, spacing of elements, slope and flow rate on Manning's coefficient were determined. Linear, quadratic and logarithmic response surfaces were calculated. Multiple correlation coefficients usually greater than 0.97 were obtained. The linear multi-variable model and the exponential model gave comparable standard deviations. A quadratic model gave slightly improved estimates, but it results in a more complex equation with eleven coefficients.
W71-06264

DEVELOPMENT OF NEUTRON ACTIVATION FOR INVESTIGATION OF WATER CLARIFICATION,
Missouri Water Resources Research Center.
For primary bibliographic entry see Field 05D.
W71-06265

PREDICTION OF MOISTURE MOVEMENT IN EXPANSIVE CLAYS,
Texas Univ., Austin. Center for Highway Research.
Robert L. Lytton, and Ramesh K. Kher.
Available from NTIS as PB-194 910, $3.00 in paper copy, $0.95 in microfiche. Research Report 18-3, May 1970. 289 p, 35 fig, 17 tab, 25 ref. DOT supported.
Identifiers: *Clays, Soil water, *Soil water, Motion, *Partial differential equations, *Numerical integration, Computer programs, Foundations, Roads, Mathematical prediction, Permeability, Bridge foundations, GCHPIP1 computer program, Crank-Nicolson method, FLOPIP2 computer program.

This report describes two computer programs for determining changing moisture distribution with time. Program FLOPIP2 is arranged to work one-dimensional problems and computer Program GCHPIP1 solves moisture distribution problems in two dimensions. The equation governing the flow of moisture is a concentration-dependent, parabolic, partial differential equation which is solved numerically using the implicit Crank-Nicolson method of marching forward in time. Although it is stable in one-dimensional problems, the Crank-Nicolson method can become unstable in two-dimensional problems, depending upon the relative size of the components of the permeability tensor. This rare form of instability is predicted theoretically and observed in one of the example problems. Example problems are worked to demonstrate the capabilities and breadth of application of the computer programs and to prove the validity of the approach. The one-dimensional example are concerned with matching measured field data and with presenting the results of a parameter study of various suction and permeability factors. The field data can be duplicated to within very close tolerances. The two-dimensional example problems are arranged to demonstrate the versatility of computer Program GCHPIP1. Problems solved include a two-dimensional consolidation problem, ponding problems, and a problem of predicting moisture distribution within a concrete highway bridge girder.
W71-06272

BEHAVIOR OF SOIL AND FERTILIZER PHOSPHORUS IN RELATION TO WATER POLLUTION,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W71-06434

CHEMISTRY OF NITROGEN IN SOILS,
Illinois Univ., Urbana. Dept. of Agronomy; and Missouri Univ., Columbia. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W71-06436

2H. Lakes

WATER CHEMISTRY OF TOXAPHENE - ROLE OF LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 05B.
W71-05840

LIMNOLOGY OF ZUNI SALT LAKE, NEW MEXICO,
Minnesota Univ., Minneapolis. Limnological Research Center.
J. P. Bradbury.
Geological Society of America Bulletin, Vol 82, No 2, p 379-398, February 1971. 20 p, 12 fig, 1 tab, 27 ref.

Descriptors: *Limnology, *Saline water, *Brines, *New Mexico, *Saline lakes, Salts, Sedimentation, Sediments, Salinity, Mixing, Thermal stratification, Density stratification, Chemical precipitation, Algae, Evaporation, Calcite, Gypsum, Water balance, Runoff.
Identifiers: Zuni Salt Lake (N Mex).

Zuni Salt Lake is a shallow saline lake in a maar in west-central New Mexico. The basin was formed during the late Pleistocene when volcanic and phreatic explosions punctured Paleozoic and Mesozoic strata. The lake is supported by runoff and saline springs (specific gravity 1.010 to 1.130), which rise along fractures in the volcanic conduits underlying the maar and apparently dissolve salt from the Permian Supai Formation. Dominant organisms of Zuni Salt Lake and the Cinder Cone Pool are Artemia salina and Hydropyrus hians. The bottom of the pool is covered with a blue-green algal mat of Anacystis sp. Sediments in Zuni Salt Lake consist of salt crusts (halite, calcite, and gypsum) inter-bedded with layers of clay and organic matter. The sediments of the pool are watery sapropel, algal material, calcite, and gypsum. Fluctuations of the chemistry, physics, and biology of these aquatic environments are extreme because of sporadic but torrential rainfall entering the shallow lakes in late summer and early fall. (Knapp-USGS)
W71-05846

THE GENERATION OF LANGMUIR CIRCULATIONS BY THE EDDY PRESSURE OF SURFACE WAVES,
Maryland Univ., College Park. Inst. for Fluid Dynamics and Applied Mathematics; and Maryland Univ., College Park. Graduate Meteorology Program.
Alan J. Faller.
Limnology and Oceanography, Vol 14, No 4, p 504-513, July 1969. 10 p, 3 fig, 12 ref. NSF Grant GA-4388.

Descriptors: *Water circulation, *Lakes, *Oceans, *Mixing, *Waves (Water), Thermal stratification, Winds, Convection, Heat transfer, Limnology, Mass transfer, Currents (Water), Model studies, Hydraulic models.
Identifiers: *Langmuir circulation.

The Langmuir circulations in lakes and oceans are shown, by theory and by the extension of laboratory experiments, to be the result of wave action. Specifically, the exponential decay of vertical oscillations that are a maximum near the free surface gives rise to an instability that is analogous to thermal convective instability but which may be two orders of magnitude or more greater than strong thermal convection. Laboratory experiments in a wind-wave tank support the predictions of the theory. Recognition of this mechanism as a primary cause of Langmuir circulations explains apparent differences between observations in lakes and oceans. (Knapp-USGS)
W71-05871

LAKE CHAMPLAIN IN RELATION TO REGIONAL WATER SUPPLY,
Vermont Univ., Burlington. Dept. of Zoology.
For primary bibliographic entry see Field 03B.
W71-05875

REMOVAL OF CONTAMINANTS FROM LAKE ONTARIO BY NATURAL PROCESSES,
Canadian Oceanographic Data Centre, Ottawa (Ontario).
For primary bibliographic entry see Field 05G.
W71-05878

INVESTIGATIONS OF DAILY VARIATIONS IN CHEMICAL BACTERIOLOGICAL AND BIOLOGICAL PARAMETERS AT TWO LAKE ONTARIO LOCATIONS NEAR TORONTO, PART I--CHEMISTRY,
Ontario Water Resources Commission, Rexdale.
For primary bibliographic entry see Field 05A.
W71-05879

TRACE ELEMENTS IN LAKE ERIE,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
For primary bibliographic entry see Field 05A.
W71-05880

SURFACE WATER INPUTS OF IODINE, BROMINE, AND CHLORINE TO LAKE HURON,
Michigan Univ., Ann Arbor. Dept. of Meteorology and Oceanography; and Michigan Univ., Ann Arbor. Great Lakes Research Div.

For primary bibliographic entry see Field 05B.
W71-05882

A FIELD STUDY OF LANGMUIR CIRCULATIONS,
State Univ. of New York, Albany.
Glenn E. Myer.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 652-663, 1969. 12 p, 11 fig, 1 tab, 21 ref.

Descriptors: *Water circulation, *Lakes, *New York, *Thermal stratification, *Stratified flow, Currents (Water), Mixing, Heat transfer, Diffusion, Convection.
Identifiers: *Langmuir circulation.

To determine the thermal structure and importance of Langmuir circulations, floating temperature probes were used in Lake George, N. Y. Under thermally stable conditions Langmuir circulations transport heat downward. Langmuir circulations are a major cause of epilimnion mixing and thermocline development and decline in lakes. The Langmuir circulations appear to be coupled to the wind by some indirect mechanism. The mechanisms for this coupling which best fit field observations on Lake George are those acting as or very near the water surface. (See also W71-05561) (Knapp-USGS)
W71-05884

SUMMER THERMAL STRUCTURE AND CIRCULATION OF CHEQUAMEGON BAY, LAKE SUPERIOR--A FLUCTUATING SYSTEM,
Wisconsin Univ., Madison. Marine Studies Center.
R. A. Ragotzkie, W. F. Ahrnsbrak, and A. Synowiec.
Supported by a grant from the E. J. du Pont de Nemours and Company. In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 686-704, 1969. 19 p, 13 fig, 4 tab, 10 ref.

Descriptors: *Water circulation, *Bays, *Lake Superior, *Thermal stratification, *Currents (Water), Great Lakes, Seiches, Wisconsin, Limnology, Waves (Water), Winds, Surveys, Current meters.
Identifiers: *Chequamegon Bay (Lake Superior).

An extensive series of measurements of thermal structure, currents and seiches was made during July and August 1968 on Chequamegon Bay, a semi-enclosed bay of Lake Superior. Analysis of these data shows that the circulation of this bay is a fluctuating system in which water movement associated with wind-induced movements of the thermocline is the primary mechanism for water exchange between the Bay and the Lake. Superimposed on this flushing mechanism is a complex pattern of temporally and spatially varying currents associated with seiche activity in the Bay. Current measurements also suggest a weak anticlockwise general circulation. It is postulated that the physical behavior of Chequamegon Bay and its interaction with Lake Superior may be characteristic of other semi-enclosed bays of the Great Lakes. (See also W71-05561) (Knapp-USGS)
W71-05885

BOTTOM SEDIMENT SAMPLING,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
For primary bibliographic entry see Field 07B.
W71-05886

GEOCHEMICAL SYSTEMS IN ONONDAGA LAKE (CENTRAL NEW YORK STATE) COMPARED WITH THE GREAT LAKES,
Slippery Rock State College, Pa. Dept. of Geology.
Jeffrey C. Sutherland.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 357-363, 1969. 7 p, 6 fig, 18 ref. FWQA Grant WPRD 66-01-68.

Descriptors: *Water chemistry, *Clay minerals, *Lakes, Silica, Calcium, Sodium Chlorides, Phosphates, Lake Huron, Lake Erie, Great Lakes, Equilibrium, Aqueous solutions, Ion exchange, Carbonates, Kaolinite, Montmorillonite.
Identifiers: Onondaga Lake (NY).

Onondaga Lake is shallow, eutrophic, and contains unusually high concentrations of dissolved Ca, Na, Cl, SiO2, and PO4. Interpretations of chemical and mineralogical data tested in equilibrium models are compared with those for the Great Lakes. The average annual condition of near equilibrium with calcite and dolomite is inherited from influent streams. Lake Erie is in equilibrium with hydroxyapatite, but Onondaga Lake is oversaturated, approaching equilibrium in winter only. Whereas lower limits of silica in the North Channel and Lake Huron are probably established through dissolution of kaolinite, upper limits upon silica in Onondaga Lake may partly be a function of reaction of kaolinite to form K feldspar. Concentrations of silica in sediment-enclosed waters of the North Channel and Onondaga Lake approach equilibrium values with amorphous silica. Equilibrium between montmorillonite and kaolinite may depend upon ratios of calcium to sodium, among other factors: In carborate mineral-bearing Great Lakes sediments kaolinite approaches equilibrium with Ca montmorillonite, but in Onondaga Lake approach to equilibrium with Na montmorillonite is inferred. (See also W71-05561) (Knapp-USGS)
W71-05888

THE QUALITATIVE DISTRIBUTION OF FELDSPARS IN SURFICIAL BOTTOM SEDIMENTS FROM LAKE ONTARIO,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
For primary bibliographic entry see Field 02J.
W71-05889

GEOLOGICAL, CHEMICAL, AND PHYSICAL ATTRIBUTES OF SEDIMENTS IN SENECA LAKE, NEW YORK,
Hobart Coll., Geneva, N.Y.; and Michigan Univ., Ann Arbor. Dept. of Meteorology and Oceanography.
For primary bibliographic entry see Field 02J.
W71-05890

WIND INDUCED CIRCULATION PATTERN IN A ROTATING MODEL OF LAKE ERIE,
State Univ. of New York, Buffalo. Faculty of Engineering and Applied Sciences.
Peter J. Buechi, and Ralph R. Rumer.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 406-414, 1969. 9 p, 10 fig, 8 ref. FWQA Grant WP-00837.

Descriptors: *Water circulation, *Lake Erie, *Currents (Water), Winds, Waves (Water), Seiches, Distribution patterns, Model studies, Hydraulic models, Hydraulic similitude, Flow, Great Lakes.
Identifiers: Lake circulation.

Experimental studies to determine the effects of a prevailing westerly wind on the circulation patterns in a vertically distorted Froude model of Lake Erie were performed in a rotating laboratory that housed the model lake, all necessary instrumentation, and personnel. A vertical scale of 1:500 and a horizontal scale of 1:200,000 were used. Wind stresses were simulated using a battery of blowers. Model wind velocities could be varied from zero to 13 ft/sec. Preliminary correlation with prototype wind speeds was obtained by measuring water level changes in the eastern end of the model lake a comparing with available prototype field observa tions for known wind conditions. Motion pictu studies with dyes serving as tracers were used in t collection of data. Comparison with earlier circu tion studies performed in the absence of wind stre reveals significant changes in the overall circu tion pattern and the appearance of significant d ferences between surface and subsurface circu tion patterns. (See also W71-05561) (Knapp USGS)
W71-05891

ESTIMATES OF MONTHLY EVAPORATIO LOSSES FROM THE GREAT LAKES 1950 T 1968 BASED ON THE MASS TRANSFE TECHNIQUE,
Department of Transport, Toronto (Ontario). Meteorological Branch.
For primary bibliographic entry see Field 02D.
W71-05892

STATISTICAL ANALYSIS OF CURRENTS A TWO NEAR-BY STATIONS IN LAK MICHIGAN, SUMMER, 1967,
Northwestern Univ., Evanston, Ill. Dept. of E gineering Sciences; and Michigan Univ., Ann A bor. Great Lakes Research Div.
G. E. Birchfield, and V. E. Noble.
In: Proceedings Twelfth Conference on Gre Lakes Research, May 5-7, 1969, University Michigan, Ann Arbor: International Associatio for Great Lakes Research, p 529-539, 1969. 11 p, fig, 4 ref.

Descriptors: *Currents (Water), *Water circula tion, *Lake Michigan, Sampling, Correlation ana ysis, Current meters, Tracking techniques, Gagin stations, Weather, Winds, Waves (Water), Gre Lakes.
Identifiers: Lake currents.

Two anchored buoy stations were placed 8 mi o Sheboygan, Wisconsin, 1/2 mi apart, in approx mately 100 m of water. Observations of currents 5-min intervals near the surface and 10 m wer made for about 8 days. Repeated measurements c currents using drogues were made during the inte val; in addition dynamic height currents were est mated from BT soundings made in the vicinity c the stations. For motions of time-scale larger tha 10-12 hr, the current meter data were closely cor related with one another. For shorter period mo tions the current meter data were seriousl distorted. Drogue measurements were fairly con sistent with the current meters, but tended to show more consistency among themselves. Dynami height currents proved inadequate. The complexit of coastal currents is illustrated with the example o currents associated with two cold-frontal passage over the Lake. (See also W71-05561) (Knapp USGS)
W71-05893

WAVE FORCES IN LAKE ERIE,
Michigan Univ., Ann Arbor. Dept. of Meteorolog and Oceanography.
Alan L. Cole.
Supported by US Lake Survey, Army Corps of En gineers. In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 540-552, 1969. 13 p 11 fig, 2 tab, 2 ref.

Descriptors: *Waves (Water), *Lake Erie, *Energy, *Coastal engineering, Great Lakes, Erosion, Shore protection, Data collections, Surges, Shores, Harbors, Pressure.
Identifiers: *Wave forces (Lake Erie).

Direct measurement of the pressure of Great Lakes' waves on a breakwater in Lake Erie at Lorain, Ohio was undertaken to produce data to be used in an evaluation of the applicability of existing theories to Great Lakes conditions and to provide

mpirical relationships for breakwater design, ship esign, and other practical needs in the Great akes. The East Breakwater Shorearm at Lorain, hio was chosen to be instrumented because of its cation, orientation, type of construction and wnership. The field project was initiated in Sepmber, 1968 and was terminated by ice conditions December, 1968, with data taken in November nd December, 1968. Wave pressure decreases elow the still water level as predicted by Sainflou. See also W71-05561) (Knapp-USGS)
W71-05894

MALL-SCALE MODEL OF THE 'THERMAL AR',
British Columbia Univ., Vancouver. Inst. of Oceanography.
G. H. Elliott, and J. A. Elliott.
n: Proceedings Twelfth Conference on Great akes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association or Great Lakes Research, p 553-557, 1969. 5 p, 3 ig, 6 ref.

Descriptors: *Thermal stratification, *Great Lakes, Stratified flow, Water circulation, Currents (Water), Water temperature, Thermocline, Limnology.
Identifiers: *Thermal bar (Great Lakes), Thermal plumes.

A two-dimensional freshwater model was used to simulate the 'thermal bar' phenomenon by heating and cooling the water through 4C. The temperature profiles were similar to observations made in the Great Lakes. The current patterns observed suggest that the 'thermal bar' is actually a thermal plume with an overriding wedge of stable water. (See also W71-05561) (Knapp-USGS)
W71-05895

INTERNAL WAVES OF THE SECOND VERTICAL MODE IN LAKE HURON,
Waterloo Univ. (Ontario). Dept. of Mechanical Engineering.
Alan M. Hale.
Supported by the Great Lakes Inst., Univ. of Toronto. In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 564-566, 1969. 3 p, 3 fig, 5 ref.

Descriptors: *Waves (Water), *Stratification, *Stratified flow, *Lakes, Great Lakes, Mathematical studies, Model studies, Interfaces, Density stratification, Currents (Water), Thermal stratification.
Identifiers: *Internal waves (Lakes).

A two-layer model is often used for the theoretical analysis of internal waves in a body of stratified fluid. Only a single mode of motion, a 'simple' oscillation of the interface (an internal wave of the first vertical mode) is predicted by this modelling. Because natural fluid bodies have a continuous density variation, corresponding theoretical analyses allow other modes of motion. One of the possible modes may be described as a pulsation of the fluid between isothermal surfaces and is called an internal wave of the second vertical mode. Experimental evidence supporting the existence of internal waves of the second vertical mode is presented. (See also W71-05561). (Knapp-USGS)
W71-05896

HYDRAULIC AND WIND-INDUCED CIRCULATION IN A MODEL OF A GREAT LAKE,
Department of Energy, Mines and Resources, Burlington (Ontario). Great Lakes Div.
P. F. Hamblin.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 567-582, 1969. 16 p, 7 fig, 10 ref.

Descriptors: *Water circulation, *Great Lakes, *Currents (Water), *Winds, Model studies, Mathematical studies, Flow, Thermal stratification, Lakes, Stratified flow, Mathematical models.
Identifiers: Wind-induced curculation (Great Lakes).

The steady state hydraulically induced circulation of a rotating lake of circular plan was studied by means of numerical solutions of the equations of fluid motion. Frictional dissipation is assumed to be accounted for by constant lateral and vertical eddy diffusivities. In a homogeneous lake of uniform depth, the circulation consists of a diffuse flow from source to sink throughout the lake. For a parabolic basin, the flow is divided into two unequal streams, each following the shoreline and having a width of approximately 10 km. Circulation due to a uniform windstress directed along a diagonal of the basin of variable depth from source to sink obscures the underlying hydraulic circulation. When two-layer stratification is taken into account, the steady state hydraulically driven circulation undergoes a marked alteration. Hydraulic flow in the upper layer assumes a configuration similar to that of the homogeneous lake of constant depth. Windstress applied to the upper layer from the source to the sink has the effect of concentrating the hydraulic circulation in a narrow stream along the shoreline of the lake to the right of the direction of flow. (See also W71-05561). (Knapp-USGS)
W71-05897

SOME UNUSUAL SURFACE WATER TEMPERATURE PATTERNS IN THE GREAT LAKES, AS DETECTED BY AIRBORNE RADIATION THERMOMETER SURVEYS,
Meteorological Service of Canada, Toronto (Ontario).
For primary bibliographic entry see Field 07B.
W71-05898

VISUAL WAVE OBSERVATIONS ALONG THE LAKE MICHIGAN SHORE,
United States Lake Survey, Detroit, Mich.
Paul C. Liu, and John G. Housley.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Micigan, Ann Arbor: International Association for Great Lakes Research, p 608-621, 1969. 14 p, 12 fig, 7 tab, 5 ref.

Descriptors: *Waves (Water), *Lake Michigan, *Data collections, Great Lakes, Fetch, Frequency, Wavelengths, Monitoring, On-site data collections, Storms, Winds, Statistics.
Identifiers: U. S. Coast Guard.

A program of visual observations of lake waves along the Lake Michigan shore was conducted during the autumns of 1966 and 1967. Observers at seven Coast Guard stations participated in this program. Observations were made from shore at each station at 4-hr intervals during the periods when small craft or storm warnings were displayed and included wave height, wave period, and direction of wave approach. The majority of wave heights observed along the Lake Michigan shore during the storm conditions were of the order of 1 m, and have periods were mostly between 3 and 7 sec. While higher wave heights were reported in the northern part of the Lake, the stations in the southern part tended to report longer wave periods. An average of 20% of waves observed on the east shore and 7% of the waves observed on the west shore were over 2 m in height. A study of the joint distributions of observed wave height and wave period indicated that the steepnesses of waves were generally quite high sometimes even exceeding 1:10. (See also W71-05561). (Knapp-USGS)
W71-05899

DIURNAL CHANGES IN STRATIFICATION AND DISSOLVED OXYGEN IN THE SURFACE WATERS OF LAKE MICHIGAN,
Michigan State Univ., East Lansing. Dept. of Botany; and North Carolina Univ., Chapel Hill. Dept. of Zoology.
Bruce A. Manny, and Charles A. S. Hall.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 622-634, 1969. 13 p, 7 fig, 2 tab, 35 ref.

Descriptors: *Dissolved oxygen, *Thermal stratification, *Lake Michigan, *Diurnal distribution, Respiration, Photosynthetic oxygen, Algae, Plankton, Limnology, Great Lakes, Water circulation, Mixing, Data collections, Primary productivity.
Identifiers: Diurnal DO changes.

First estimates of gross community production (23.7 g of 02 per sq m per day) and respiration (26.4 g of 02 per sq m per day) for Lake Michigan were obtained by the diurnal oxygen curve method at two inshore stations off Grand Haven, Michigan during a period of high plankton densities. Diurnal temperature changes of more than 3 deg C in the upper epilimnion resulted in partial breakdown of epilimnetic stratification leading to establishment of nocturnal isothermy. Such marked diurnal changes should be considered when interpreting surface and epilimnetic temperatures between stations because the magnitude of diurnal temperature variation may exceed station to station variability. Effects of wind mixing, internal standing waves and lateral and vertical transport appeared in the data and are discussed. Although these factors could not be neglected in Lake Michigan, the diurnal oxygen curve method performed adequately and warrants further trials on the Great Lakes. (See also W71-05561). (Knapp-USGS)
W71-05900

LARGE-SCALE DIFFUSION STUDIES AT NIAGARA RIVER MOUTH, LAKE ONTARIO,
Canada Center for Inland Waters. Department of Energy, Mines and Resources, Burlington (Ontario).
For primary bibliographic entry see Field 07B.
W71-05901

DISTRIBUTION OF TRACE METALS IN IMPOUNDMENTS,
Arkansas Univ., Fayetteville Resources Research Center.
For primary bibliographic entry see Field 05B.
W71-05971

ON THE MECHANISM OF LANGMUIR CIRCULATIONS AND THEIR ROLE IN EPILIMNION MIXING,
State Univ., of New York, Albany. Dept. of Earth and Atmospheric Sciences.
Jon T. Scott, Glenn E. Myer, Ronald Stewart, and Eric G. Walther.
Limnology and Oceanography, Vol 14, No 4, p 493-503, July 1969. 11 p, 11 fig, 27 ref. OWRR Project B-015 NY (2).

Descriptors: *Water circulation, *Mixing, *Lakes, *Thermal stratification, New York, Winds, Convection, Epilimnion, Heat transfer, Limnology, Mass transfer, Currents (Water), Solar radiation, Waves (Water).
Identifiers: *Langmuir circulation, Lake George (NY).

Six mechanisms have so far been proposed to explain Langmuir circulations and their associated wind streaks. One mechanism involving shearing instability and two requiring the action of a surface film are supported by the greatest amount of evidence. Studies at Lake George, New York, suggest that more than one mechanism may operate at one location. A particular mechanism may operate at a specific site because of typical conditions at the site, but a different mechanism may be more important at another site. Plots of thermal structure in the near-surface layer of Lake George and measurements of vertical current velocities suggest that Langmuir circulations are the most important mixing process in the epilimnia of lakes. (See also W71-05561) (Knapp-USGS)
W71-05975

JULY CURRENTS NEAR THE SOUTH SHORE OF LAKE ONTARIO,
State Univ. of New York, Albany. Dept. of Atmospheric Sciences.
Jon T. Scott, and Dennis R. Landsberg.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 705-722, 1969. 18 p, 16 fig, 4 tab, 19 ref. OWRR Project B-015 NY (1).

Descriptors: *Water circulation, *Currents (Water), *Lake Ontario, Great Lakes, Current meters, Jets, Waves (Water), Stratified flow, Winds, New York, Water temperature.
Identifiers: *Geostrophic flow.

Drogue measurements of current speed and direction at five anchored buoys near the south shore of Lake Ontario from 11 to 20 July 1968 near Fairhaven, N.Y., showed that total transport in the 35 m layer was northeastward along the shore. However, at stations 1 and 2 km from shore there was a southwestward flowing 'countercurrent.' The maximum northeastward 'coastal jet' was computed from daily temperature soundings at 10 stations. Internal waves and wind fluctuations did not mask the baroclinic geostrophic flow for this nearshore case. Baroclinic geostrophic flow and total transport were to the northeast in the surface layers, but the analysis indicated there was a slow return flow opposed to these. Transport in deep water was, therefore, southwestward. The baroclinic geostrophic computation is a good predictor of surface currents in summer when the latter are much larger than the steady return barotropic flow. (See also W71-05561) (Knapp-USGS)
W71-05978

CONDITIONS AFFECTING THE REDUCTION OF IRON AND MANGANESE BY BACTERIA IN THE ORE-BEARING LAKES OF THE KARELIAN ISTHMUS,
Akademiya Nauk SSSR, Leningrad. Institut Tsitologii.
For primary bibliographic entry see Field 02K.
W71-05993

PRIMARY PRODUCTION AND CHEMICAL AND PHYSICAL CHARACTERISTICS OF LAKE ASHTABULA RESERVOIR, NORTH DAKOTA,
North Dakota State Univ., Fargo. Div. of Natural Resources.
John J. Peterka, and Leonard A. Reid.
Proceedings of the North Dakota Academy of Science, Vol 22, p 138-156, 1968. 7 fig, 4 tab, 19 ref.

Descriptors: *Lakes, *Primary productivity, *Chemical properties, *Physical properties, Reservoirs, Sampling, Phytoplankton, Analytical techniques, Temperature, Chlorophyll, Hydrogen ion concentration, Alkalinity, Phosphorus, Nitrates, Nitrites, Ammonia, Dissolved solids, Biochemical oxygen demand, Photosynthesis, Eutrophication, North Dakota.
Identifiers: *Lake Ashtabula (ND), Self-inhibition.

This study of Lake Ashtabula Reservoir, ND recorded from May to December the average phytoplankton crop as 101 g/sq m of chlorophyll a, corresponding to dry organic matter content of 121 kg/ha. The average gross photosynthesis during the same period was 2.2 g C/sq m per day. The almost continual bloom of algae is attributed to warm water and prolonged water circulation. The limited oxygen production per unit of chlorophyll may have been caused by the heavy blooms with photosynthetically inactive cells, or photosynthesis-inhibiting substance produced by the phytoplankton. Regression analysis failed to indicate any significant relationship of productivity with the contents of N and P, suggesting a possibility of an influence of some other nutrient element limiting the photosynthesis. (Wilde-Wisconsin)
W71-06008

THE EFFECTS OF THERMAL DISCHARGES ON THE STRATIFICATION CYCLE OF LAKES,
Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
For primary bibliographic entry see Field 05C.
W71-06082

THE MIXING OF A SHALLOW SUBMERGED HEATED WATER JET WITH AN AMBIENT RESERVOIR,
Maryland Univ., College Park. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 05C.
W71-06084

VERTICAL DIFFUSIVITY COEFFICIENT IN A THERMOCLINE,
Department of Energy, Mines and Resources, Ottawa (Ontario). Marine Sciences Branch.
H. E. Sweers.
Limnology and Oceanography, Vol 15, No 2, p 273-280, March 1970. 3 fig, 1 tab, 7 ref.

Descriptors: *Thermal pollution, *Thermocline, Temperature, Depth, Isotherms, Lake Ontario.
Identifiers: *Vertical diffusivity coefficient, Lake mean heat content.

Two equations are presented giving the vertical eddy diffusivity coefficient, Kz, in the thermocline of a well-stratified lake as a function of its mean rate of downward displacement and intensity. Both equations are derived by transforming the heat transport equation into a quasi-Lagrangian coordinate system, the origin of which moves down with the lake mean thermocline depth. These equations can only be used to give analytical description of the downward movement of the thermocline in general terms. They cannot be used to describe the actual physical processes causing this movement nor even the changes in thermocline depth over short time intervals or in small fraction of the lake. Applications of the equations to Lake Ontario yields summer mean values of Kz in the thermocline of 0.02 to 0.07 cm sq per sec. During an exceptionally quiet period in July and August, 1967, Kz approached the value of molecular diffusivity, 0.0012 cm sq/sec. The vertical diffusivity of heat in and below the thermocline is smaller than the vertical diffusion in epilimnion. Therefore, the thermocline acts as a barrier to downward convection of heat. (Upadhyaya-Vanderbilt)
W71-06088

COLORADO SEMIDRAINAGE MOUNTAIN LAKES,
Colorado Univ., Boulder. Dept. of Biology.
Robert W. Pennak.
Limnology and Oceanography, Vol 14, No 5, p 720-725, September 1969. 6 p, 1 fig, 1 tab, 15 ref.

Descriptors: *Limnology, *Colorado, Mountains, Nitrates, Organic matter, Biological properties, Nutrients, Runoff, Overland flow, Seepage, Surface-groundwater relationships, Eutrophication.
Identifiers: Semidrainage lakes.

A distinctive semidrainage lake type is common at midmountain elevation in Colorado. Such lakes are similar in their small size, shallow depth, lack of an outlet, high nitrate content, high organic content, and high water color. 'Indicator species' are Rana pipiens, neotenic Ambystoma tigrinum, Gammarus limnaeus, an association of three leeches (Nephelopsis obscura, Glossiphonia complanata, and Helobdella stagnalis), and Nuphar polysepalum. Usually 8 to 14 species of rooted aquatics are present by late summer. Sponges are abundant, fish are absent, and plankton is sparse. Evidence is presented to show that semidrainage lakes are limnoseres. (Knapp-USGS)
W71-06165

A CASE STUDY OF COASTAL CURRENTS IN LAKE MICHIGAN,
Northwestern Univ., Evanston, Ill. Technological Inst.
G. E. Birchfield, and Daniel R. Davidson.
Proceedings, Tenth Conference on Great Lak Research, Toronto, Canada, 1967: Internatio Association for Great Lakes Research, p 264-22 1967. 10 p, 7 fig, 11 ref.

Descriptors: *Currents (Water), *Lake Michig *Winds, *Current meters, *Statistical metho On-site investigations, Eddies, Flow rates, Mov ment, Wind velocity, Temperature, Water circu tion, Costs, Methodology, Stations, Climatology.
Identifiers: *Statistical analysis (Winds and c rents).

A statistical study of winds and currents is made f two adjacent buoy stations near shore in t southern basin of Lake Michigan for the la summer and autumn of 1963. Weekly mean c rents and vector variances, 18-hour mean currer and transports, variance and covariance spectra a calculated for the episode. A broad southerly lo shore baroclinic coastal current persisted for number of weeks in the first part of the episode; t current shows no correlation with the wi direction, and little with the wind speed. In t latter part of the episode maximum speeds are a sociated with a more narrow inshore, barotrop coastal current, which is closely correlated with t wind field. The currents at the station farthe offshore exhibit very large amplitude oscillatio near the inertial period, in the first part of t episode studied. (Woodard-USGS)
W71-06174

SELECTIVE WITHDRAWAL AT LAK LIVINGSTON, PRELIMINARY EVALUATION 1969,
Texas Univ., Austin. Center for Research in Wate Resources.
For primary bibliographic entry see Field 05C.
W71-06193

REGENERATION OF THE SEVAN,
Army Foreign Science and Technology Cente Charlottesville, Va.
V. Kadzhaya.
Available from NTIS as AD-715 367, $3.00 i paper copy, $0.95 in microfiche. Translated fro Nauka i Zhizn; No 3, p 60-64, 1970. Technic Translation FSTC-HT-23-1103-70, October 197 10 p, 6 fig.
Identifiers: *Lakes, Water supplies, *Inland wate ways, Construction, Power plants, Establishment Volume, Economics, Electric power production USSR, Translations, *Lake Sevan, Arpa-Seve Canal, *Lake restoration.

Beginning in the 1930's the Lake Sevan was con stantly reduced in size in order to supply water fo the needs of hydroelectric power stations. As result, the volume and area of the lake constantl decreased. This plan for sacrificing Lake Seven fo the needs of the national economy could only con tinue for a period of about 50 years. Fortunately, a the end of the 50 years other conditions had arise which have made it possible to begin work on th restoration of Lake Sevan. This article describe some of the measures which are being taken for thi purpose. Emphasis is on construction of the Arpa Sevan canal. The article is of interest to those con cerned with Russian Hydroelectric Power.
W71-06330

EFFECTS OF AGRICULTURAL POLLUTION ON EUTROPHICATION,
Wisconsin Univ., Madison. Dept. of Sanitary En gineering, and Wisconsin Univ., Madison. Dept. o Water Chemistry.
For primary bibliographic entry see Field 05C.
W71-06443

2I. Water in Plants

A STUDY OF RELATIONSHIPS BETWEEN ZOOPLANKTON ABUNDANCE AND SELECTED ENVIRONMENTAL VARIABLES IN

THE PAMLICO RIVER ESTUARY OF EASTERN NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept of Zoology.
David S. Peters.
MS thesis, Dep of Zoology, North Carolina State Univ, 1968. 38 p, 4 fig, 6 tab, 50 ref. OWRR Project B-0040NC (6).

Descriptors: *Zooplankton, *Estuaries, *Copepods, Light intensity, Environmental effects, Temperature, Salinity, Turbidity, Chlorophyll, North Carolina.
Identifiers: *Pamlico River Estuary (NC), Harpoticoid copepods, Calanoid copepods, Chlorophyll-a.

The relationship between the abundance of zooplankton and environmental variables was studied from October 1965 to July 1967 in the Pamlico River estuary, N. C. The distribution of harpacticoid copepods was regulated by light, few organisms being present in the water column during the day; their increased concentration at night may have been partly due to wind-mixing. The calanoid copepods were the most frequent constituents of the estuary zooplankton. According to the results of multiple regression, their abundance was related to salinity, temperature, oxygen concentration, turbidity, light intensity, and food supply provided by phytoplankton and detritus. Temperature was particularly important in the lower part of the river, whereas oxygen concentration--in the upstream. (Wilde-Wisconsin)
W71-05985

ENVIRONMENTALLY-INDUCED CHANGES IN THE FATTY ACIDS OF CHLORELLA,
Maryland Univ., College Park. Dept. of Botany.
Leal G. Dickson, Raymond A. Galloway, and Glenn W. Patterson.
Plant Physiology, Vol 44, p 1413-1416, 1969. 3 tab, 17 ref. NIH Grant T01G M0097603.

Descriptors: *Algae, *Carbon dioxide, *Environmental effects, *Chlorella, Analysis, Cultures, Lipids, Metabolism, Inhibitors.
Identifiers: *Fatty acids, Chlorella fusca, Palmitic acid, Cell division, Heterotrophic culture, Autotrophic culture.

An initial investigation of why and how Chlorella accumulates fatty acids was made. Qualitative and quantitative analyses were performed on the major fatty acids of Chlorella fusca, Shihira and Krauss, in both autotrophic and heterotrophic cultures. Cells grown heterotrophically were subjected to carbon dioxide concentrations as great as 40%-in-air. The major fatty acids of autotrophic cells grown under a 1% environmental concentration of carbon dioxide, in order of concentration were 16:0, 18:3, 16:4, 18:2, 18:1 and 16:3. Analysis of heterotrophic cells at 1% carbon dioxide, by comparison, indicated a complete absence of 16:4, reduced amount of 18:3, and increased amounts of the other major acids. An increase in the environmental concentration of carbon dioxide (from 1-30%) over the heterotrophic cultures produced a 40% increase in total lipids and nearly a 50% increase in fatty acids. Palmitic acid (16:0) and 18:1 largely account for the fatty acid change by increasing from 12 mg to 33 mg/g dry weight and 8 mg to 17 mg/g dry weight respectively. Possible explanations for this enhanced synthesis of fatty acids are suggested. (Jones-Wisconsin)
W71-05992

ALGAL TOXINS,
New Hampshire Univ., Durham. Dept. of Zoology.
Miyoshi Ikawa.
Summary of 1970 University of New Hampshire faculty Sigma Xi Lecture delivered November 19, 1970 at Durham, New Hampshire. 4 p. OWRR Projects A-004-NH (5) and A-013-NH (3).

Descriptors: *Algal toxins, Dinoflagellates, Chrysophyta, Cyanophyta, Mortality, Inhibitors, Antibiotics (Pesticides), Red tide.
Identifiers: *Biotoxins, Ciguatoxin, Mycrocysten, Saxitoxin, Tetrodotoxin, Paralytic shellfish poisoning, Antibiotics, Acetylcholine.

Recent research identified biotoxins, including extremely potent saxitoxin and tetrodotoxin, emitted by marine and fresh water algae, predominantly dinoflagellates, chrysophytes, and blue-green species. Paralytic shellfish poisoning (PSP), fish kills, and death of birds, livestock, dogs, and even human beings are among the direct or food chain consequences. Gonyaulax catanella, Gymnodinium breve, G tamarensis, Pyrodinium phoneus, Microcystis aeruginosa, Anabaena flos aquae, and Aphanizomenon flos aquae are among the demonstrated or suspected sources of biotoxins. In this study, a small amount of unidentified inhibitor of acetylcholine esterase was isolated from Gymnodinium breve, and also a substance highly toxic to mice was extracted from the Aphanizomenon. An additional study revealed antibiotic properties of Chondrus crispus and Euthora cristata, the red algae highly inhibitory to Chlorella. (Wilde-Wisconsin)
W71-05999

OBSERVATIONS ON FLUCTUATIONS IN THE ABUNDANCE OF PLANKTON IN RELATION TO CERTAIN HYDROLOGICAL CONDITIONS OF RIVER GANGA,
Central Inland Fisheries Research Inst., Allahabad (India).
D. V. Pahwa, and S. N. Mehrotra.
Proceedings of the National Academy of Science, India, Vol 36, Part 2, Section B, p 157-189, 1966. 11 fig, 3 tab, 36 ref.

Descriptors: *Plankton, *Fluctuation, *Hydrologic data, Distribution, Turbidity, Temperature, Hydrogen ion concentration, Dissolved oxygen, Bicarbonates, Chlorides, Nitrates, Silicates, Carbon dioxide, Carbonates, Phosphates, Seasonal, Diatoms, Rotifers, Sampling, Depth, Color, Velocity, Width, River beds, Chlorophyta, Copepods, Cyanophyta, Protozoa, Chrysophyta, Euglenophyta, Dinoflagellates, Chlorella, Scenedesmus, Euglena.
Identifiers: *Ganges River (India).

Distribution and seasonal fluctuations of plankton, relative to physicochemical factors, were studied at seven stations on the Ganges River. Temperature, turbidity, pH, dissolved oxygen, bicarbonates, chlorides, nitrates, and silicates showed similar fluctuation trends, but free carbon dioxide, carbonate and phosphate fluctuations were dissimilar. Temperature was high December-February and low May-October. Water was turbid from July-October. Dissolved oxygen values were maximum January-February and minimum July-September. Bicarbonates, chlorides and silicates were minimal during the monsoon season, maximal during the summer. Free carbon dioxide was present July-November and absent January-May; and absent during June at some stations but highest at others. Carbonates were present only during absence of carbon dioxide. Phosphates showed erratic fluctuations with maxima during monsoon. Plankton production showed bimodal cycle with one peak in June and the other sometime during December-March; July-October showed plankton minima. Peaks of zooplankton and phytoplankton mainly coincided with each other. Phytoplankton groups were more prevalent in upper river stretches. May and June mostly recorded primary peaks of the year. Diatoms and rotifers, respectively, dominated the phytoplankton and zooplankton, except at two stations where copepods exceeded rotifers. (Jones-Wisconsin)
W71-06004

PERIPHYTON ACCRUAL IN THE KASKASKIA RIVER AND ADJACENT FLOODPLAIN POOLS IN EAST-CENTRAL ILLINOIS,
Illinois Univ., Urbana. Dept. of Zoology.
Edward C. Doyle.
MS thesis, Dept of Zoology, Illinois Univ, Urbana, 1971. 119 p, 23 fig, 18 tab, 88 ref. OWRR Project B-025-ILL (1).

Descriptors: *Periphyton, *Primary productivity, *Rivers, Standing crop, Biomass, Chlorophyll, Sampling, On-site tests, Illinois.
Identifiers: *Kaskaskia River (Ill), Accrual rate, Floodplain pools.

The subject of this thesis is distribution of periphyton, a rather neglected group of primary producers. The accrual of organisms on glass slides disclosed a much larger standing crop in the Kaskaskia River than in three floodplain pools. This difference in the productivity was due to the stimulating influence of river's current and the depressing shading effect in the pools. Differences in the production of separate pools are attributed to the sporadic occurrence of Ceratophyllum. The biomass and maturity of periphyton communities are influenced by composition and depth of water, concentration of silt suspension, and the position of slides. Good agreement was observed between chlorophyll a and the periphyton biomass. The high light intensity failed to decrease the surface periphyton production. (Wilde-Wisconsin)
W71-06011

PHYSIOLOGY OF BOLL SHEDDING IN COTTON: IV. CORRELATION STUDIES ON FLOWER PRODUCTION AND BOLL SHEDDING IN RELATION TO TEMPERATURE AND RAINFALL,
Indian Agricultural Research Inst., New Delhi.
For primary bibliographic entry see Field 03F.
W71-06056

VARIATIONS IN WATER STRESS IN ONE-YEAR-OLD NEEDLES OF A PONDEROSA PINE,
New Mexico State Univ., University Park; and Arizona Univ., Tucson.
G. L. Cunningham, and H. C. Fritts.
Journal of the Arizona Academy of Science, Vol 6, No 2, p 117-120, October 1970. 1 tab, 1 fig, 9 ref. NSF Grant GB-3658.

Descriptors: *Moisture stress, *Vapor pressure, *Ponderosa pine trees, *Semiarid climates, Seasonal, Leaves, Environmental effects, Modes of action, On-site data collections, Climatic data, Metabolism, Translocation, Plant growth.
Identifiers: *Water potential.

As part of an ongoing effort to evaluate a proposed model for the influence of climate on tree-ring width, it was desirable that the influences of seasonal variation and environmental factors on leaf water status be examined. A single ponderosa pine, growing on a semiarid site at 2500 m. elevation was chosen for study because of it's 'sensitive' ring chronology, indicating that moisture frequently limits the growth of the annual ring. Needle water potentials were measured by the dye method and soil moisture conditions and atmospheric vapor pressure were measured and correlated with leaf water potential. Eight 24 hr. sampling periods were done at weekly intervals between May 1-June 27, 1965, during which time there was a general environmental drying trend. In the first half of May, soil water potential and leaf water potential were high, and the latter showed no correlation with vapor pressure deficit (VPD). In later May, soil water potential decreased and needle water potential was linearly correlated with VPD. In June, needle water potential remained high and did not vary with VPD. It is postulated that in early May, soil moisture was adequate for maintenance of leaf tissue, but in late May, soil moisture was low and needle water deficits responded to VPD. By early June, new needles had appeared and lowered osmotically active carbohydrates by rapid translocation. (Casey - Arizona)
W71-06057

RADIAL WATER AND SOLUTE FLOWS IN ROOTS OF ZEA MAYS; I. WATER FLOW,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
H. Ginsburg, and B. Z. Ginzburg.
Supported by US Department of Agriculture Grant FG-IS-181, Project No A10-SWC-31. Journal of Experimental Botany, Vol 21, No 68, p 580-592, August 1970. 4 fig, 3 tab, 25 ref.

Descriptors: *Flow, *Root systems, *Estimating equations, *Laboratory tests, *Plant tissues, Vascular tissues, Structure, Corn (Field), Mode of action, Plant physiology, Osmotic pressure, Water balance, Metabolism, Permeability, Hydraulic conductivity, Model studies, Calcium, Tritium, Inflow, Ureas, Solutes, Membranes, Membrane processes, Inhibition.
Identifiers: *Reflection coefficients, *Osmotic flow.

Differential radial movements of both water and solutes across roots are difficult to study because of structural complexity of the root system. 'Sleeve' preparations are root segments from which the central stele has been removed, leaving the epidermis, exodermis, cortex and the outer part of the broken endodermis. Although very complex, they have the advantage of being less complex than the whole root system. Sleeves were prepared, mounted in paraffin wax baths and perfused with tritiated water (HTO). When osmotic pressure differences were zero, steady state fluxes of HTO were then measured and permeability coefficients were estimated. Bathing the sleeve with DNP, a metabolic inhibitor, results in a small increase in HTO influx but in no change in efflux. Using standard flow equations, hydraulic conductivity and reflection coefficients of urea and sucrose could be calculated at known osmotic pressure differences and measured volume flow rates. The reflection coefficients were very close to 1.0. Effects of the metabolic inhibitors, DNP, CCCP and KCN, were tested on osmotic flow. At high inhibitor concentrations there was a remarkable inhibition of water flow, but almost no effect on sucrose permeability, indicating that changes in osmotic water flow could be attributed to changes in hydraulic conductivity. Several models of water flow through root tissue are discussed in light of the data. It is concluded that most of the water moving radially moves by some route additional to cell walls and is probably coupled to some chemical reactions. (Casey - Arizona)
W71-06064

EFFECTS OF IRRIGATION INTENSITY AND NITROGEN LEVEL ON THE PERFORMANCE OF EIGHT VARIETIES OF UPLAND COTTON, GOSSPYIUM HIRSUTUM L.,
Arizona Agricultural Experiment Station, Yuma.
For primary bibliographic entry see Field 03F.
W71-06068

THE ROLE OF SUCCULENT HALOPHYTES IN THE WATER BALANCE OF SALT MARSH RODENTS,
California Univ., Los Angeles. Dept of Zoology.
Harry N. Coulombe.
Oecologia, Vol 4, No 3, p 223-247, 1970. 5 fig, 3 tab, 40 ref.

Descriptors: *Salt marshes, *Rodents, *Halophytes, *Physiological ecology, *Nutrient requirements, Water balance, Animal physiology, Osmotic pressure, Chlorides, Electrolytes, Water loss, Evaporation, Saline water, Saline soils, Animal behavior, Vegetation effects, Environmental effects, California, Ecosystems, Plant physiology.
Identifiers: *Succulents, *Millet, *Torpor, *Cricetid rodents.

Soil moisture in salt marshed may be 60% greater in salt concentrations than sea water, leading to the designation of salt marshes as 'physiological deserts'. Southern California salt marshes are inhabited by a number of succulent halophytes and by 3 species of cricetid rodents, Peromyscus maniculatus, Reithrodontomys megalotis (Harvest mouse) and Microtus californicus (Meadow mouse). Since fresh water is nonexistant in these areas, succulent halophytes may play a role in water balance and ecology of the rodents. Data are therefore needed on the amount of physiologically available water in the plant tissues and the osmoregulatory abilities of the animals. Hydraulic pressure sap extractions from Salicorna virginica (pickleweed) yielded average Cl ion concentrations of 955 mEq/L. and a total osmotic pressure (TOP of 1450 mOsm/L. Several other local species were analyzed and one--Suaeda fruticosa--showed increases of TOP and root depth with distance away from the lagoon's edge. Harvest mice lost an average 1.35 mg water/cc oxygen consumed through pulmocutaneous evaporation, which is among the highest water losses known for small mammals. In testing for possible water sources, different groups of harvest mice were placed on 1 of 3 regimes: (1) Pickleweed only (mean water content of 84.7% fresh weight), (2) millet only (free water content of 6% by weight and (3) Pickleweed and millet. Meadow mice were tested only on (3). The harvest mice survived only on the millet diet while meadow mice could survive on (3). Weight loss and urine analyses also led to the conclusion that succulent plants are unimportant to the normal water economy of salt marsh rodents. Possibly, harvest mice may survive short term dehydration by undergoing daily torpor. The possible roles of dew and sea water as water sources are discussed. (Casey - Arizona)
W71-06073

EFFECT OF TIME OF EXPOSURE TO SALINITY ON GROWTH, WATER STATUS AND SALT ACCUMULATION IN BEAN PLANTS,
National and Univ. Inst. of Agriculture, Rehovoth (Israel). Volcani Inst. of Agriculture Research; and Hebrew Univ. Jerusalem (Israel).
A. Meiri, E. Mor, and Alexandra Poljakoff-Mayber.
Supported by Israeli Ministry of Agriculture and Israeli Board. Annals of Botany, Vol 34, No 135, p 383-391, March 1970. 1 fig, 3 tab, 25 ref.

Descriptors: *Leaves, *Salinity, *Plant physiology, *Evapotranspiration, *Plant growth, Osmotic pressure, Chlorides, Potassium, Sodium, Calcium, Magnesium, Hydrogen ion concentration, Conductivity, Laboratory tests, Light, Turgidity.
Identifiers: *Water potential, *Relative water content.

Plants have shown abilities to adapt themselves to saline media, but the basic adaptive mechanisms involved are not understood. Since transpiration has been shown in some cases to facilitate absorbed ion transport in some plants, an attempt was made to investigate correlations between transpiration during salinity exposure and the growth, water status and ionic composition of the plant. Using non-saline (-0.6 bars) and saline (-2.8 bars) media, 2 series of experiments were carried out in bean plants. In one series, plants were grown continuously in either saline or non-saline media. In the second series one group was grown in saline medium during the day and non-saline at night, while conditions were reversed for the other group. The results showed that in bean plants, under conditions of relatively low evapotranspirative demand, transpiration during salinity exposure affects neither salt accumulation in the leaves nor any other effects normally associated with salinity exposure. Sap chloride levels were directly proportional to time of exposure to salinity, whether in the light or dark. K uptake also seemed proportional to time in saline media. The larger plants were exposed to saline media, the more anions were replaced by chloride. Cation levels were not significantly changed. (Casey - Arizona)
W71-06074

YIELD REDUCTION BY CONTROLLED FLOODING OF CORN,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W71-06152

ENVIRONMENTAL EFFECTS ON WO PRODUCTION AND CAMBIAL ACTIVITY ZIZIPHUS SPINACHRISTI (L.) WILLD.,
Tel Aviv Univ. (Israel). Dept. of Botany.
Nili Liphschitz, and Y. Waisel.
Supported by a grant from the Citrus Board Israel. Israel Journal of Botany, Vol 19, No 4 592-598, 1970. 4 fig, 1 tab, 10 ref.

Descriptors: *Trees, *Plant growth, *Soil-wat plant relationships, *Environmental effe *Moisture availability, Modes of action, Season Ecology, Leaves, On-site investigations, Semia climates, Xylem, Phenology, Light, Laborat tests.
Identifiers: *Israel, *Seedlings, *Cambium, *T rings.

Z.spina-Christi is a lowland thermophilic, shru like tree with a diffuse porous type xylem, native Israel. Since it occurs in areas with differing wa regimes, an attempt was made to investigate e vironmental control of cambial activity and annu ring features. Two groups of trees, near each oth were selected from an area about 200 m. below s level. The first group (I) was situated on the sho of a lake where the tree roots were submerged water. The second group (II) were scattered abo the sides of an east-facing mountain side. Quantit tive differences were seen between the 2 grou With group I, cambial activity (monthly mean ce layer production) was bimodal, with growth sta ing in April, peaking in May, declining to zero June and peaking again in August. Group II showe cambial activity only in the spring. Floweri periods and leaf development were found to be a sociated with cambial activity, and both we strongly affected by water, indicating the wat availability, in that region, is the key environmen factor which governs both the duration and rate cambial activity. This was reinforced by increase cambial and phenological activity in a wet yea The effects of water on the radial growth seem be indirect and mediated by the buds. Laborato tests indicated no photoperiodic effects, either o the length of cambial activity or the type of woo product. (Casey-Arizona)
W71-06214

ESTABLISHMENT OF PERENNIAL FORAGES I. SUBSEQUENT YIELDS; II. SUBSEQUEN ROOT DEVELOPMENT,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 03F.
W71-06215

EFFECT OF IRRIGATION ON RECOVERY O APPLIED NITROGEN BY COTTON,
Agricultural Research Service, Thorsby, Ala. Soi and Water Conservation Research Div.; and Au burn Univ., Ala. Dept. of Soils.
For primary bibliographic entry see Field 03F.
W71-06216

SEED TABLETS FOR PRECISION PLANTING LETTUCE,
Arizona Agricultural Experiment Station, Mesa.
For primary bibliographic entry see Field 03F.
W71-06224

2J. Erosion and Sedimentation

HYDRODYNAMIC EFFECTS OF SEEPAGE ON BED PARTICLES,
Utah State Univ., Logan. Dept. of Civil Engineering.
Gary Z. Watters, and Manam V. P. Rao.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY3, Paper 7973, p 421-439, March 1971. 19 p, 11 fig, 11 ref. NSF Grant GK913.

Descriptors: *Seepage, *Sediment transport, *Alluvial channels, Hydrodynamics, Groundwater movement, Surface-groundwater relationships, Sediments, Sedimentation, Reynolds number, Porous media.
Identifiers: Hydrodynamic drag, Hydrodynamic lift.

The effects of effluent and influent seepage on the hydrodynamic forces acting on an idealized noncohesive sediment particle were investigated experimentally. The hydrodynamic conditions near and within the porous medium of the channel bed were simulated through the use of shear-velocity Reynolds number and seepage Reynolds number. Drag and lift forces on a sediment particle were measured by a force dynamometer with and without the effects of effluent or influent seepage flow. The results are presented in the form of drag and lift coefficients as functions of shear-velocity Reynolds number for different effluent or influent seepage Reynolds numbers. The effects of seepage on the dynamic forces acting on a sediment particle are analyzed to explain the observed experimental results. (Knapp-USGS)
W71-05839

WATER CHEMISTRY OF TOXAPHENE - ROLE OF LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 05B.
W71-05840

SEDIMENTS OF THE NORTHERN MIDDLE AMERICA TRENCH,
Woods Hole Oceanographic Institution, Mass.
David A. Ross.
Geological Society of America Bulletin, Vol 82, No 2, p 303-321, February 1971. 19 p, 12 fig, 4 tab, 24 ref. ONR Contract N00014-66-C-0241.

Descriptors: *Sedimentation, *Sediment transport, *Deposition (Sediment), Geology, Stratigraphy, Sediments, Marine geology, Provenance, Sedimentary structures, Sediment distribution, Sediment yield, Sedimentation rates.
Identifiers: *Middle America Trench.

The Middle America Trench is a tectonically unstable area in which sediments have accumulated rapidly. Little sediment accumulates permanently on the continental flank seaward of this basin. Sediments from the seaward flank have more biogenous material due to a lower rate of terrigenous deposition. Heavy minerals, coarse sands in the trench, facies similarities, displaced Foraminifera, and a textural gradation along the trench axis suggest that the sediments in the trench were deposited by turbidity currents. Carbon-14 dates indicate sedimentation rates as high as 146 cm/1000 yrs in the trench bottom. Assuming constant conditions, the sediments found in the trench bottom would have taken only 4.5 million yrs to accumulate. Sediment thicknesses vary along the trench axis but are consistent with present ideas of platetectonics. Sedimentary facies of the Middle America Trench and the Gulf of California are similar due to the predominance of tectonic factors over depositional factors in these areas. (Knapp-USGS)
W71-05844

DEFORMATION OF LEE-SIDE LAMINAE IN EOLIAN DUNES,
Geological Survey, Denver, Colo.; and National Park Service, Yellowstone National Park, Wyo.
Edwin D. McKee, John R. Douglass, and Suzanne Rittenhouse.
Geological Society of America Bulletin, Vol 82, No 2, p 359-378, February 1971. 20 p, 10 fig, 5 tab, 16 ref.

Descriptors: *Dunes, *Sedimentary structures, *Aeolian soils, *Sands, Deposition (Sediments), Sediment transport, Moisture content, Beaches, Coasts, Wind erosion, Winds.
Identifiers: *Sand dunes, *Eolian dunes.

Processes responsible for structures in sand dunes consist of (1) primary deposition by saltation and creep and by settling from suspension, (2) redeposition accompanying avalanching, and (3) penecontemporaneous erosion. Characteristics of dune structures were examined in the field by introducing marker beds of magnetite at times of sand deposition, thus recording original surfaces and making possible the determination of subsequent changes. Avalanching in sand is of two types: sand flow and slumping. Deformational structures characteristic of each were recorded in the field and were reproduced in the laboratory. Analysis of these structures suggests criteria for distinguishing compressional types (lower dune slope) from tensional types (upper dune slope). The analysis of deformational structures also serves to distinguish between forms developed in cohesive sand and those in non-cohesive sand. Since the degree of cohesion is largely a function of the amount of moisture in the sand the structures provide a means for recognizing original moisture content. (Knapp-USGS)
W71-05845

THE ORIGIN OF THE LABYRINTH, WRIGHT VALLEY, ANTARCTICA,
Waikato Univ., Hamilton (New Zealand). School of Science.
M. J. Selby, and A. T. Wilson.
Geological Society of America Bulletin, Vol 82, No 2, p 471-476, February 1971. 6 p, 6 fig, 10 ref.

Descriptors: *Weathering, *Geomorphology, *Antarctic, *Salts, *Joints (Geology), Erosion, Glaciers, Floods.
Identifiers: Wright Valley (Antarctica), Salt weathering.

The Labyrinth is an area of 30 sq km of steep-sided troughs, some with no outlets, cut into a sill of the Ferrar Dolerite Formation. Hypotheses for its origin include fluvial erosion by meltwater in an interglacial stage, a volcanically induced flood, jokulhlaup, glacial erosion, and sub-glacial erosion. These hypotheses are rejected as having no field evidence in their favor. It is suggested that selective salt weathering working along major joints and in areas of close-jointing is an hypothesis supported by the field evidence that it is essentially uniformitarian. (Knapp-USGS)
W71-05847

SUBAQUEOUS SLUMP STRUCTURES,
Brooklyn Coll., N.Y. Dept. of Geology.
Edward Sturm.
Geological Society of America Bulletin, Vol 82, No 2, p 481-483, February 1971. 3 p, 2 fig, 10 ref.

Descriptors: *Sedimentary structures, *Sedimentation, *Landslides, Deposition (Sediments), Bottom sediments, Marine geology.
Identifiers: *Subaqueous slump structures.

Curved, grading into planar, discordant slump scar surfaces are not uncommon in sedimentary rocks. It is suggested that the slump movement took place penecontemporaneously with the processes of sedimentation and in response to loading imbalances due to the presence of a slope. The curvature of the slump surface may be derived by resolving the vector representing the displacement, or offset, and relating its vertical component to the volume decrease associated with void ratio reduction. The particular shape of the surface is largely a function of the clay mineral content of the sediments. (Knapp-USGS)
W71-05848

SEDIMENTS OF THE MODERN NIGER DELTA: A SUMMARY AND REVIEW,
Reading Univ. (England).
J. R. L. Allen.
In: Deltaic Sedimentation, Modern and Ancient, Morgan, James P. and Shaver, Robert H., editors, The Society of Economic Paleontologists and Mineralogists Special Publication No 15, 138-151, November 1970. 14 p, 6 fig, 22 ref.

Descriptors: *Deltas, *Sedimentation, *Sedimentary structures, Deposition (Sediments), Sediment transport, Waves (Water), Bed load, Suspended load, Sedimentology, Stratigraphy, Coastal plains, Flood plains, Swamps, Beaches.
Identifiers: *Niger Delta (Africa).

The modern Niger delta exemplifies a type of delta in which sand as well as mud is supplied to a receiving water body of high energy. The depositional environments, and corresponding sedimentary facies, are distributed concentrically within the deltaic region. The deltaic plain is divisible into the floodplain (upper and lower), tidal swamp, and beach-barrier environments. The depositional environments present in the submerged part of the delta are: river-mouth bars, delta-front platform, prodelta slope, and open shelf. There are also in the submerged part of the delta large areas where littoral and subtidal sands due to the Flandrian transgression are still exposed at the surface of sedimentation. The deltaic deposits decrease horizontally in grain size from the floodplain to the open shelf but vertically increase in coarseness from the silty clays of the open shelf to the predominantly fine- to medium-grained sands of the floodplain. (Knapp-USGS)
W71-05856

DEPOSITIONAL SEQUENCES AND SAND DISTRIBUTION IN THE POSTGLACIAL RHONE DELTA COMPLEX,
Shell Development Co., Ventura, Calif.
Eppo Oomkens.
In: Deltaic Sedimentation, Modern and Ancient, Morgan, James P. and Shaver, Robert H., editors, The Society of Economic Paleontologists and Mineralogists Special Publication No 15, p 198-212, November 1970. 15 p, 10 fig, 1 tab, 17 ref.

Descriptors: *Deltas, *Sedimentation, *Texas, *Gulf of Mexico, *Sedimentary structures, Deposition (Sediments), Sediment transport, Bed load, Suspended load, Sedimentology, Stratigraphy, Coastal Plains.
Identifiers: *Rhone Delta (France).

An analysis of the lithological relationships in the postglacial Rhone delta complex of France shows that the deltaic sediments can be grouped in one of the following depositional sequences: (a) transgressive sequences, (b) regressive sequences, and (c) channel-fill sequences. Transgressive sequences are due to a process whereby the rate of subsidence exceeds that of sedimentary buildup. This process leads to deposition of a sediment body in which coastal plain deposits are overlain by coarse-grained coastal barrier deposits that are in turn overlain by marine deposits. Regressive sequences are due to a process whereby sediment-laden river water enters a basin that is filled with water of higher density (for example, sea or lagoon). This process produces a sediment body that contains fine-grained sediment at its base and dominantly coarse-grained sediment at its top. Channel-fill sequences are due to a process whereby a decrease in current velocity occurs in a channel. This process produces a sediment body that contains coarse-grained sediment at its base and dominantly fine-grained sediment at its top. (Knapp-USGS)
W71-05857

SEDIMENTATION IN A MALAYSIAN HIGH TIDE TROPICAL DELTA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
James M. Coleman, Sherwood M. Gagliano, and William G. Smith.
In: Deltaic Sedimentation, Modern and Ancient, Morgan, James P. and Shaver, Robert H., editors, The Society of Economic Paleontologists and Mineralogists Special Publication No 15, p 185-197, November 1970. 13 p, 17 fig, 5 ref. ONR Contract Nonr 1575 (03), Task Order NR 388 002.

Descriptors: *Deltas, *Sedimentation, *Texas, *Gulf of Mexico, *Sedimentary structures, *Tropical regions, Deposition (Sediments), Sediment

transport, Bed load, Suspended load, Sedimentology, Stratigraphy, Coastal Plains, Wet climates, Monsoons.
Identifiers: *Klang-Langat Delta (Malaysia).

The compound delta of the Klang and Langat Rivers on the Malay Peninsula illustrates the processes, morphology and sedimentary framework associated with a number of small high tidal deltas found in tropical southeast Asia. Both the delta and its catchment basin are located in the wet tropics and have mean annual rainfall ranging from 80 to 110 inches. Wave-energy levels along the delta coast are low to moderate. However, the range of mean spring tides is 14 feet; therefore, tidal processes dominate sediment dispersal patterns and control delta form. Characteristics of the delta include parallel ridge-and-trough bottom topography on the sea floor in the delta vicinity, large areas of low tide flats, complex networks of streams that serve the dual function of tidal streams and river distributaries, extensive mangrove swamps, and large fresh-water peat swamps. Associated with these features and environments are distinctive sedimentary facies. (Knapp-USGS)
W71-05858

HYDROGRAPHY, SEDIMENT DISPERSAL, AND RECENT HISTORICAL DEVELOPMENT OF THE PO RIVER DELTA, ITALY,
South Carolina Univ., Columbia.
Bruce W. Nelson.
In: Deltaic Sedimentation, Modern and Ancient, Morgan, James, P. and Shaver, Robert H., editors, The Society of Economic Paleontologists and Mineralogists Special Publication No 15, p 152-184, November 1970. 33 p, 27 fig, 3 tab, 37 ref. Grant GP-525 NSF1.

Descriptors: *Deltas, *Sedimentation, *Sedimentary structures, Deposition (Sediment), Sediment transport, Waves (Water), Bed load, Suspended load, Sedimentology, Stratigraphy, Coastal plains, Flood plains, Swamps, Beaches.
Identifiers: *Po River Delta (Italy).

Significant parameters of the Po Delta, Italy, include a mountainous source area near the site of deltaic deposition, a freshwater discharge of nearly 1,500 cubic meters/ second, a sediment load that consists predominantly of sand and silt, a tidal range of 60 centimeters, a quiet sea of high salinity, and a locus of deposition on a shallow shelf that subsides slowly in the vicinity of the delta. The artificial form of the modern delta is caused by man-made works constructed in historical times to control the distributaries. Today 60 percent of the river flow and 75 percent of the sediment load discharge through a single distributary. The delta advances in front of the controlled distributaries at rates that are very much higher than those that characterized the prehistoric delta. Profiles of salinity, temperature, and suspended sediment concentration obtained within the distributaries, in front of the delta, and in the Adriatic Sea illustrate the kinds of interactions between fresh and salt water that lead to sediment dispersal and deposition. (Knapp-USGS)
W71-05859

FACIES AND DEVELOPMENT OF THE COLORADO RIVER DELTA IN TEXAS,
Esso Production Research Co., Houston, Tex.
William H. Kanes.
In: Deltaic Sedimentation, Modern and Ancient, Morgan, James P. and Shaver, Robert H., EDITORS, The Society of Economic Paleontologists and Mineralogists Special Publication No 15, p 78-106, November 1970. 29 p, 25 fig, 5 tab, 65 ref.

Descriptors: *Deltas, *Sedimentation, *Texas, *Gulf of Mexico, *Sedimentary structures, Deposition (Sediments), Sediment transport, Bed load, Suspended load, Sedimentology, Stratigraphy, Coastal Plains.
Identifiers: *Colorado River Delta (Tex).

The recent delta of the Colorado River of Texas is an exceptional model for analyzing sediment and faunal facies relationships in environments associated with deltas. Because of the delta's small size it is feasible to obtain closely spaced cores to provide the information essential for making a detailed facies study. Moreover, air photographs document (1) growth from a linear shoreline to the lobe-shaped deposit formed prior to artificial channeling of the river through a barrier island and (2) development of an 8- to 10- foot-thick platform of deltaic sediments, which divides Matagorda Bay, during the 6-year period following removal of an upstream log jam. This study of delta progradation was concentrated in the northeastern part of the Colorado delta, an area unaffected by manmade modifications. Continuous cores and borings define the deltaic facies complex and the underlaying bay facies. The sequence of facies and environments from the surface downward is (1) delta-plain root-mottled clay and silt (1 to 5 feet thick) with 'algal crusts' giving way locally to massive and burrowed clays of the channel-fill environment; (2) delta-front sand (2 to 8 feet thick), characterized by small-scale crossbedding, which grades laterally into finer grained sediment; (3) prodelta reddish-brown laminated silty clays (1 to 5 feet thick); and (4) bay laminated and burrow-mottled silty clays and clayey silts (10 to 14 feet thick), which lie unconformably on the Pleistocene. (Knapp-USGS).
W71-05860

BOTTOM SEDIMENT SAMPLING,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
For primary bibliographic entry see Field 07B.
W71-05886

A STUDY OF FRESHWATER SAND GRAIN SURFACES BY SCANNING ELECT RON MICROSCOPY,
Illinois Univ., Urbana. Dept. of Geology.
For primary bibliographic entry see Field 07B.
W71-05887

THE QUALITATIVE DISTRIBUTION OF FELDSPARS IN SURFICIAL BOTTOM SEDIMENTS FROM LAKE ONTARIO,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
Richard L. Thomas.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 364-379, 1969. 16 p, 8 fig, 3 tab, 8 ref.

Descriptors: *Bottom sediments, *Lake Ontario, *Mineralogy, Great Lakes, Sedimentation, Sediment transport, Bed load, Suspended load, Provenance, Deposition (Sediments), Sampling, Data collections, Weathering, Water chemistry, Paleoclimatology.
Identifiers: *Feldspars.

A qualitative assessment of the feldspar distribution in Lake Ontario sediments was made by the determination of the feldspar end members, K, Na and Ca, on sediment residues after fusion with potassium pyrosulphate. Both K adsorption and cation exchange of Na and Ca for K in standard feldspars was observed. Cation exchange is minimal in samples and in standards with a full particle size range. K adsorption is high yet appears to be constant and not directly related to grain size. In the inshore zones a poor positive correlation of feldspar to quartz is believed to be the result of poor mixing in a traction load sediment. In the basin zones the relationship is of a higher order and reflects natural sorting by sedimentation from a suspended load. The regional distribution of the feldspars shows an inshore to offshore decrease, initially, of calcic feldspar, then of sodic feldspar leading to a basin enrichment of the potash feldspars, microcline and orthoclase. The feldspars a probably derived predominantly by coast line ex sion of glacial deposits surrounding Lake Ontari (See also W71-05561) (Knapp-USGS)
W71-05889

GEOLOGICAL, CHEMICAL, AND PHYSICA ATTRIBUTES OF SEDIMENTS IN SENEC LAKE, NEW YORK,
Hobart Coll., Geneva, N.Y.; and Michigan Uni Ann Arbor. Dept. of Meteorology and Oceano raphy.
Donald L. Woodrow, Thomas R. Blackburn, and Edward C. Monahan.
In: Proceedings Twelfth Conference on Gre Lakes Research, May 5-7, 1969, University Michigan, Ann Arbor: International Associati for Great Lakes Research, p 380-396, 1969. 17 p, fig, 7 tab, 11 ref, append. US Navy Contra N70024-68-C-0190, Underwater Sound Lab.

Descriptors: *Bottom sediments, *Sedimentatio *Sediment transport, *Lakes, Suspended load, Be load, Mineralogy, Particle size, Profiles, Glaci drift, Seismic studies, Sounding, Stratificatio Stratigraphy, Bathymetry, Water chemistry.
Identifiers: *Seneca Lake (NY).

In Seneca Lake, New York, coarse-grained heterogeneous sediments cover the bottom nea the shoreline; fine-grained, cohesive clays occur o the lake slope; and very fine-grained, non-cohesiv muds are found on the floor of the deep lake. Clay comparable to those exposed on the lake slope ar overlain at the top of the slope by near-shore sed ments and at the base of the slope by deep lak sediments, suggesting that the lake slope sediment are the oldest ones sampled. Values of chemica and physical parameters are plotted and contoure on maps of the Lake. The contours are generall parallel to bathymetric contours. Oxygen value are highest in near-shore sediments, sulfide an chloride values are highest in the deep lake sedi ments, and pH is near neutrality in all sediments Densities of the sediments range from 1.85 near th shoreline to 1.05 in the deep lake. The shea strength of near-shore sediments is approximatel three times that of deep lake sediments. Seismic data indicate that the bedrock profile is a broad 'V and the total thickness of the lake sediments varie from about 600 ft in the axial part of the Lake to zero at, or near, the shoreline. A complex series o lake-filling events is indicated but the presently operative processes of clastic transport appear to account for much of the younger material making up the fill. (See also W71-05561) (Knapp-USGS)
W71-05890

CHEMICAL CHARACTERIZATION OF BOTTOM SEDIMENTS,
Environmental Protection Agency, Cincinnati, Ohio. Water Quality Office.
For primary bibliographic entry see Field 05A.
W71-05981

THE UPLAND FOREST VEGETATION OF THE BOIS BRULE RIVER BASIN, TRIBUTARY TO LAKE SUPERIOR,
Wisconsin State Univ., Superior. Dept of Biology.
Donald W. Davidson.
Wisconsin State University, Superior, Center for Lake Superior Environmental Studies, Contribution No 17, 1970. 13 p, 21 ref. OWRR Project A-023-Wis (5).

Descriptors: *Forest soils, *Forests, *Sediment control, Erosion control, Forest management, Water conservation, Soil erosion, Surface runoff, Drainage effects, Lake Superior, Watersheds (Basins), Wisconsin, Sediment load, Sampling, Soil stabilization, Vegetation.
Identifiers: *Brule Basin (Wis), Red clay soils.

The Brule River Basin (Wisconsin) was the study site on upland forest vegetation in conjunction with studies of sediments and water chemistry of the

Brule River. Dominant tree species were sampled in 51 stands, representative of various stages of xeric northern forests. Most of the Brule Basin is presently forested, serving as an important water control agent; uncut forested land decreases the sediment load transported to Lake Superior. Clear-cutting clearing on red clay will result in a raised water table and may prove disastrous. Some erosion problems arose from farming practices, road construction, and right-of-way operations through the red clay zone. Observations indicate that the south shore of Lake Superior is partially caving in due to unknown causes. A red clay soil area of 680,000 acres is severely eroded and produces high sediment loads to Lake Superior; stabilization vegetation of exposed red clay surfaces is emphasized. Land use and proper land management are critical considerations to the ecology of the Great Lakes. (Auen-Wisconsin)
W71-05987

THE NET EXCHANGES OF PHOSPHORUS BY ESTUARINE SEDIMENTS IN FLOWING WATERS,
North Carolina State Univ., Raleigh. Dept. of Zoology.
Herbert L. Davis, III.
MS thesis, Dep of Zoology, North Carolina State Univ, Raleigh, 1968. 41 p, 3 tab, 23 ref, 3 append. OWRR Project B-004-NC (7).

Descriptors: *Phosphorus, *Sediments, Sands, Mud, Transport depletion, Water pollution sources, Water pollution effects, Model studies, Estuaries, Analysis.
Identifiers: *Net mass transport, Phosphorus exchange, Formaldehyde.

Sand and mud from the Pamlico Estuary (NC) were placed into two sets of troughs while a third set of troughs was left without sediment. Estuarine water was gravity fed through the troughs either untreated or enriched in potassium phosphate with or without formaldehyde. The net mass transports of reactive and unreactive phosphorus were recorded by analyses. As indicated by student's t test, significant mass transports were obtained for mud sediment which retained dissolved reactive phosphorus. No significant mass transport was obtained for sand due to its low retention capacity. A suggestion is made that the variability of the results could be decreased by the use of chemostat water pumps, phosphorus-32, and larger samples. (Wilde-Wisconsin)
W71-06010

THE MATTHES ROLLING DIAMETER AS AN INDICATOR OF CHANNEL STABILITY,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
T. H. F. Nevins.
Journal of Hydrology (New Zealand), Vol 7, No 1, p 47-50, 1968. 4 p, 1 fig, 1 ref.

Descriptors: *Sediment transport, *Bed load, *Gravels, Channel morphology, Discharge (Water), Sedimentation, Sediment load, Tractive forces.
Identifiers: *New Zealand.

In mature rivers, the rolling diameter of the largest stone on the deepest part of the bed, together with the bank-full depth, will give an indication of the river slope. 'Rolling diameter' is defined as that diameter on which a stone rolls as if it were a barrel. These observations are easily made, and a high degree of accuracy is not necessary. The method was applied to a number of New Zealand rivers. Most of the first observations made showed reasonable agreement with the Matthes diagram. Observations made on stable reaches, particularly after a flood, gave a good fit, almost invariably in the torrent part of the diagram. When the reach was unstable, or the bed was masked by smaller travelling shingle, there was no fit. The method therefore provides a useful guide to the state of equilibrium of the reach. If there is no fit, then the bed is masked by sediments usually smaller than those required or the formation of a stable bed. (Knapp-USGS)
W71-06169

THE SAN SIMON WATERSHED: REVEGETATION,
Arizona Univ., Tucson. Dept. of Watershed Management; and Arizona Agricultural Experiment Station, Tucson.
For primary bibliographic entry see Field 04D.
W71-06223

PINYON-JUNIPER CONTROL: WHERE, WHY,
Arizona Univ., Tucson. Dept. of Watershed Management; and Arizona Univ., Tucson. Dept. of Range Management.
For primary bibliographic entry see Field 04D.
W71-06225

FLOOD PLAIN INFORMATION, ONTONAGON RIVER, ONTONAGON, MICHIGAN, AND LAKE SUPERIOR SHORELINE, ONTONAGON COUNTY, MICHIGAN.
Stanley Consultants, Inc., Muscatine, Iowa.
For primary bibliographic entry see Field 04A.
W71-06232

2K. Chemical Processes

GEOCHEMICAL SURVEY OF MISSOURI, PLANS AND PROGRESS FOR SECOND SIX-MONTH PERIOD (JANUARY-JUNE, 1970).
Geological Survey, Denver, Colo. Regional Geochemistry Branch.

Geological Survey Environmental Geochemistry Report, June 1970. 60 p, 7 fig, 10 tab, 24 ref.

Descriptors: *Geologic investigations, *Chemical analysis, *Soil-water-plant relationship, Water analysis, *Missouri, Analytical techniques, Methodology, Laboratory tests, Spectrophotometry, X-ray fluorescence, Colorimetry, Gravimetric analysis, Test procedures, Geology, Soil tests, Vegetation, Aquifers, Groundwater, Aquifer characteristics.
Identifiers: *Environmental Health Center (U of Mo), Atomic absorption.

This is the second-six-month progress report on studies in environmental geochemistry in the State of Missouri initiated on behalf of the Environmental Health Surveillance Project in July, 1969. The studies provide general information pertaining to the occurrence and distribution of chemical elements in rocks, soils, plants, and water throughout the State. Because the environmental geochemistry studies in Missouri may extend over a considerable period of time, perhaps 5 years, it is important to maintain consistency in laboratory methods from the beginning of the project to the end. This will insure that observed geochemical variation reflects actual variation in the materials sampled rather than changes in laboratory methodology. The analytical methods for rocks, soils, plants, and water are presented. The phase of the project directed at the water of the State so far has been concerned with the problems of sampling underground waters, as these are expected to best represent the geochemical environment. (Woodard-USGS)
W71-05854

UREA CONVERSION TO AMMONIA IN WATERLOGGED SOILS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
R. D. Delaune, and Wm. H. Patrick, Jr.
Soil Science Society of America Proceedings, Vol 34, No 4, p 603-607, July-August 1970. 5 p, 7 fig, 3 tab, 12 ref.

Descriptors: *Ureas, *Hydrolysis, *Ammonia, *Soil water, *Saturated soils, Chemical reactions, Ionization, Chemical properties, Rates, Timing, Volatility, Methodology, Test procedures, Agriculture, Rice, Chemical analysis.
Identifiers: *Urea hydrolysis, *Ammonia volatilization.

There was little or no difference in the rate or extent of urea hydrolysis in waterlogged soils and in soils kept at one-third bar moisture. Under both moisture conditions, urea hydrolysis proceeded at an initial rate of about 8 to 12 ppm per hour and began to level off after about 24 hours in most of the soils studied. About one-half to three-fourths of the urea was converted to ammonia after 3 to 4 days of incubation. The soil pH at which maximum conversion of urea occurred was about pH 8 for both moisture conditions. Ammonia loss from surface applied urea was slightly greater under one-third bar moisture conditions than under waterlogged conditions, although in neither case was the loss large at moderate rates of urea application. Ammonia loss was very low from surface-applied ammonium sulfate. In flooded soils the conversion of surface applied urea to ammonia took place in the soil and not in the flood water. (Woodard-USGS)
W71-05866

EH AS AN OPERATIONAL PARAMETER IN ESTUARINE STUDIES,
Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography.
For primary bibliographic entry see Field 02L.
W71-05873

GEOCHEMICAL SURVEY OF MISSOURI, PLANS AND PROGRESS FOR FIRST SIX-MONTH PERIOD (JULY-DECEMBER, 1969).
Geological Survey, Denver, Colo. Regional Geochemistry Branch.

Geological Survey Environmental Geochemistry Report, December 1969. 49 p, 8 fig, 15 ref.

Descriptors: *Geologic investigation, *Soil-water-plant relationships, *Geology, *Geochemistry, *Missouri, Soil chemistry, Chemical properties, Soil analysis, Geological surveys, On-site investigations, Vegetation, Rock properties, Grasses, Trees, Chemical analysis.
Identifiers: *Environmental Health Center (Univ of Mo).

This survey is being made on behalf of the Environmental Health Center of the University of Missouri, and is intended to estimate the abundance and distribution of elements in rocks, soils, vegetation, and water throughout the State. The principal effort during the first 6 months (July to December, 1969) of the project has been in gaining a familiarity with the rocks, soils, and vegetation of the State. Some preliminary sampling programs designed to estimate the chemical variability in soils and selected vegetation were executed and examinations were made of contamination in rocks, soils, and vegetation along highways. The observations are based principally on the results of about 500 preliminary analyses. The very large amounts of lead and zinc present in the roadside trees, contrasted with the small amounts in trees away from the road, strongly suggest that the high values resulted from road contamination. The upper limit of analysis for lead was 5,000 ppm. (Woodard-USGS)
W71-05874

THE USE OF CONCENTRATIONS OF ELECTROLYTES AND NATURALLY FLUORESCENT MATERIALS TO STUDY WATER MASS MOVEMENTS IN A FRESHWATER 'ESTUARY',
Michigan Technological Univ., Houghton. Dept. of Bio Sciences.
For primary bibliographic entry see Field 02L.
W71-05877

SOME VARIATION IN THE QUALITY OF WATER FROM THE SOURCE AND MOUTH OF THE NIAGARA RIVER,
State Univ. of New York, Buffalo. Dept. of Biology.
For primary bibliographic entry see Field 05A.
W71-05881

DISSOLVED MINERAL QUALITY OF GREAT LAKES WATERS,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
For primary bibliographic entry see Field 05A.
W71-05883

GEOCHEMICAL SYSTEMS IN ONONDAGA LAKE (CENTRAL NEW YORK STATE) COMPARED WITH THE GREAT LAKES,
Slippery Rock State College, Pa. Dept. of Geology.
For primary bibliographic entry see Field 02H.
W71-05888

ON THE OCCURRENCE OF TRANS-3-HEXADECANOIC ACID IN CHLORELLA CELLS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Plant Physiology.
G. L. Klyachko-Gurvich, V. E. Semenenko, and A. G. Vereshchagin.
English summary. Biokhimiya, Vol 35, No 4, p 808-814, 1970. 1 fig, 4 tab, 26 ref.

Descriptors: *Cytological studies, *Organic acids, *Lipids, *Chlorella, Biochemistry, Metabolism, Analytical techniques, Light, Nitrogen.
Identifiers: *T3H, *Trans-3-hexadecanoic acid, Linolenate, Palmitate, Chloroplasts.

The partition and gas-liquid chromatography revealed that the X-acid of lipids in Chlorella cells is the trans-3-hexadecanoic acid (T3H), which comprises up to 3.5% of the total content of fatty acids. In nitrogen-starved cells, the T3H constitutes 2.0 to 4.9% of the tri-gliceroids. With an increase in light intensity T3H concentration increases from 1.7 to 4.8%. A positive correlation was established, at different light intensities, between the T3H content and the concentration of linolenate and palmitate. Consideration is given to the possibility of a participation of the T3H and linolenates in the biosynthesis of chloroplast lipids. (Wilde-Wisconsin)
W71-05989

CONDITIONS AFFECTING THE REDUCTION OF IRON AND MANGANESE BY BACTERIA IN THE ORE-BEARING LAKES OF THE KARELIAN ISTHMUS,
Akademiya Nauk SSSR, Leningrad. Institut Tsitologii.
E. P. Troshanov.
Microbiology, Vol 38, No 4, p 634-643, 1969. 1 fig, 5 tab, 8 ref.

Descriptors: *Iron, *Bacteria, *Manganese, *Demineralization, Lakes, Oxides, Aerobic bacteria, Carbohydrates, Nitrogen compounds, Bottom sediments, Oxygen, Enzymes, Hydrogen ion concentration, Oxidation-reduction potential, Ions, Organic acids, Soil bacteria, Water purification, Adsorption.
Identifiers: *Karelian Isthmus (SSR), Ferric hydroxide.

Wide distribution and variety of bacteria which reduce iron and manganese oxides in bottom deposits of Karelian Isthmus lakes have been studied, together with the effect of anaerobic conditions, sources of ferric oxide, carbohydrates, and nitrogen-containing compounds influencing ability of bacteria isolated from bottom deposits to reduce iron and manganese. Iron reduction increases in the majority of strains under conditions of oxygen deficiency, and decreases only in the case of aerophilic strains; manganese reduction is affected by anerobic conditions to a lesser degree. Freshly precipitated ferric hydroxide is reduced more intensively by weak and vigorous strains than is iron ore. Oxidized nitrogen (potassium nitrate) inhibits iron reduction by all strains, especially by those of low activity, without affecting manganese reduction. Effect of carbohydrates on the capacity of bacteria for iron reduction varies, depending on a combination with a nitrogen-containing component and on the strain species. Bacterial cultures reduce iron by an enzymatic process; reduction of manganese oxides partially proceeds by oxidation-reduction reactions with reducing substances. Unlike iron, small amounts of manganese ions are found in sterile substrates with reducing sugars or with some organic acids. (Jones-Wisconsin)
W71-05993

GRAPHIC DISSOLVED OXYGEN COMPUTATION,
Montana State Univ., Bozeman.
For primary bibliographic entry see Field 01A.
W71-06121

WATER QUALITY OF THE DELAWARE RIVER ESTUARY, JULY THROUGH DECEMBER 1967,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05A.
W71-06156

METHODS FOR CHEMICAL ANALYSIS OF FRESH WATERS.
Hydrobiologisch Institutt, Nieuwersluis, (Netherlands); and Westfield Coll., London (England).

International Biological Programme Handbook No 8 (Second Printing), 1970: Blackwell Scientific Publications, Oxford and Edinburgh. 166 p, 29 fig, 15 tab, 157 ref.

Descriptors: *Water analysis, *Methodology, *Chemical analysis, *Water chemistry, *Conferences, Laboratory tests, On-site tests, Water properties, Inorganic compounds, Organic compounds, Colorimetry, Chromatography, Fluoremetry, Electrophoresis, Flame photometry, Spectrophotometry.

This manual is based on discussions during the IBP (International Biological Program) Technical Meeting Chemical Environment in the Aquatic Habitat, held in Amsterdam and Nieuwersluis, October 10-16, 1966. Methods of analysis for groups of compounds were considered by working groups, and the edited reports of the chairmen of these groups form the basis of the manual. This manual of chemical methods is meant as a guide for research workers interested in those biological processes in fresh water, that lead, with interconversion of energy, to the production of organic material. The chemical environment is important for many of these processes and the methods may help to describe it. Many of the methods are intended for application only to filtered water. Some may also be used for particulate matters as well. As a rule, only those methods are included which have been tested in use, either by participants of the technical meeting or in limnological laboratories known to them. The working conditions in limnological research vary from field work to laboratory work in advanced institutions. Keeping this in mind this manual is conceived on three levels of refinement of methods with differences in the necessary experience, exactitude and complexity of equipment or apparatus involved. Most determinations are therefore described-if possible-at three different levels, although the different levels are often variations on one theme. (Woodard-USGS)
W71-06159

SODIUM, MAGNESIUM, AND CALCIUM SULFATE ION-PAIRS IN SEAWATER AT 25C,
Oregon State Univ., Corvallis. Dept. of Oceanography.
Dana R. Kester, and Ricardo M. Pytkowicz.
Limnology and Oceanography, Vol 14, No 5, p 686-692, September 1969. 7 p, 5 tab, 28 ref.

Descriptors: *Water chemistry, *Sulfates, *Sea water, Calcium sulfate, Sodium sulfate, Magnesium, Ions, Chemical reactions, Equilibrium.
Identifiers: Ion-pairs (Sea water).

The stoichiometric association constant of CaSO4 ion-pairs was found to be 10.8 plus or minus 0.7 at 25C at an effective ionic strength of 0.67 and at 1 atm pressure. The percentages of free and ion-paired species in seawater were calculated from the experimentally determined association constants for NaSO4, MgSO4, and CaSO4 ion-pairs. The results were used to calculate the effective ionic strength of seawater and to account for the difference in activity coefficients in seawater and in single-salt solutions. (Knapp-USGS)
W71-06166

EFFECT OF TEMPERATURE ON THE pH OF SEAWATER,
Kiel Univ. (West Germany). Institut für Meereskunde.
Joris M. Gieskes.
Limnology and Oceanography, Vol 14, No 5, p 679-685, September 1969. 7 p, 5 tab, 18 ref.

Descriptors: *Hydrogen ion concentration, *Water temperature, *Sea water, Carbonates, Carbon dioxide, Equilibrium, Measurement, Water chemistry, On-site tests, Laboratory tests.
Identifiers: *Water temperature-pH relations.

The temperature coefficient of the pH of seawater calculated from existing data on the carbonate system in seawater, was confirmed experimentally as ..0.0114 pH units per degree Celsius at 1 atm pressure. Direct pH measurements on seawater are accurate only to about 0.02 pH units hence computations of components of the carbonate system are uncertain by 1% in bicarbonate and 5% in carbonate. These uncertainties can be halved if pH values are derived from precise determination of other components of the carbonate system, such as alkalinity and total CO2. (Knapp-USGS)
W71-06167

WELL RECORDS, DEPTH-TO-WATER MEASUREMENTS, CHEMICAL ANALYSES OF GROUND WATER, DRILLERS LOGS, AND ELECTRIC-LOG INFORMATION IN HEMPSTEAD, LAFAYETTE, LITTLE RIVER, MILLER, AND NEVADA COUNTIES, ARKANSAS,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 04B.
W71-06229

2L. Estuaries

SEDIMENTS OF THE NORTHERN MIDDLE AMERICA TRENCH,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W71-05844

DEFORMATION OF LEE-SIDE LAMINAE IN EOLIAN DUNES,
Geological Survey, Denver, Colo.; and National Park Service, Yellowstone National Park, Wyo.
For primary bibliographic entry see Field 02J.
W71-05845

FACIES AND DEVELOPMENT OF THE COLORADO RIVER DELTA IN TEXAS,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 02J.
W71-05860

EH AS AN OPERATIONAL PARAMETER IN ESTUARINE STUDIES,
Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia). Div. of Fisheries and Oceanography.
M. Whitfield.
Limnology and Oceanography, Vol 14, No 4, p 547-558, July 1969. 12 p, 10 fig, 30 ref.

Descriptors: *Oxidation - reduction potential, *Hydrogen ion concentration, *Sea water, *Estuaries, Instrumentation, Water analysis, Water chemistry, Chemical potential, Chemical reactions, Water quality, Aqueous solutions.
Identifiers: Estuarine water.

Quantitative interpretation of Eh measurements in natural aqueous systems is difficult because of problems associated with the technique of measurement, the performance of the inert metal electrode, and the thermodynamic behavior of the environment. However, the parameter is useful as a semiquantitative indicator of the degree of stagnation of a particular environment. A compound probe is described that reduces the technical problems and enables pH, Eh, and pS (-2) measurements to be made simultaneously on a single sample. With this probe, Eh can be used as an operational parameter to map the distribution of estuarine sediments. (Knapp-USGS)
W71-05873

THE USE OF CONCENTRATIONS OF ELECTROLYTES AND NATURALLY FLUORESCENT MATERIALS TO STUDY WATER MASS MOVEMENTS IN A FRESHWATER 'ESTUARY',
Michigan Technological Univ., Houghton. Dept. of Bio Sciences.
James D. Spain, David B. Drown, and James M. Yanko.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 723-733, 1969. 11 p, 8 fig, 15 ref.

Descriptors: *Electrolytes, *Fluorescence, *Water chemistry, *Estuaries, *Lake Superior, Mixing, Thermal stratification, Water circulation, Currents (Water), Chlorides, Winds, Stratified flow, Water temperature, Turnovers, Tracers, Tracking techniques, Great Lakes.
Identifiers: *Keweenaw Waterway (Mich).

The Keweenaw Waterway of the Upper Peninsula of Michigan is a drowned pre-glacial river valley in which the Sturgeon River and several smaller streams meet with the waters of Lake Superior in a manner which is physically similar to that which occurs in an estuary. Chloride ion concentration, temperature and natural fluorescence have been studied at various depths and various stations in the Waterway over the past 22-month period. Waters containing as high as 150 ppm chloride move into the Portage Lake from Torch Lake during the period of winter stagnation forming three distinct layers according to water source. After spring overturn there is a uniform concentration of about 30 ppm chloride. Wind-driven currents of Lake Superior water enter the Waterway during the summer as a dense cold wedge on the bottom. By the end of fall overturn, the chloride concentration has been reduced to about 6 ppm by flushing action. The relative contribution of water from the three major sources is estimated by solution of equations involving chloride concentration and natural fluorescence. (See also W71-05561) (Knapp-USGS)
W71-05877

A STUDY OF RELATIONSHIPS BETWEEN ZOOPLANKTON ABUNDANCE AND SELECTED ENVIRONMENTAL VARIABLES IN THE PAMLICO RIVER ESTUARY OF EASTERN NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept of Zoology.
For primary bibliographic entry see Field 02I.
W71-05985

EUTROPHICATION STUDIES OF A SHALLOW INLET ON VANCOUVER ISLAND,
Fisheries Research Board of Canada, Nanaimo (British Columbia). Biological Station.
Michael Waldichuck.
Journal Water Pollution Control Federation, Vol 41, No 5, Part 1, p 745-764, 1969. 15 fig, 2 tab, 14 ref.

Descriptors: *Estuaries, *Flushing, *Eutrophication, Water pollution effects, Water pollution control, Tides, Effluents, Sampling, Salinity, Temperature, Nutrients, Canals, Dredging, Water pollution sources.
Identifiers: *Vancouver Islands (Canada), *George Narrows (Canada), *Portage Inlet (Canada), Seasonal variations.

While nutrient input into Portage Inlet (British Columbia) is not large, volume of the system is small and flushing mechanism so poor that nutrients tend to concentrate. Phosphates and nitrates are absorbed by plankton and deposited. Provincial Government plans for a canal from Thetis Cove to Portage Inlet with locks for flushing the system rapidly appears a solution. Ecology will be modified and summer temperature in Portage Inlet will be reduced, making it less suitable for bathing--a small price for cleaner water to be regularly replaced by tidal action and for navigation improvement. Dredging might restore the inlet system removing much of the nutrients fixed in the sediments and rooted vegetation, but can be only a palliative if nutrients sources from the drainage system are not eliminated. Effect on ecology is unknown. It is conceivable that removal of rooted aquatics would lead to greater availability of nutrients to plankton resulting in undesirable concentrations of 'red tide' type organisms. (Jones-Wisconsin).
W71-05988

STUDIES OF MARINE ESTUARINE ECOSYSTEMS DEVELOPING WITH TREATED SEWAGE WASTES,
North Carolina Univ., Chapel Hill; and North Carolina Univ., Morehead City. Inst. of Marine Sciences.
H. T. Odum, and A. F. Chestnut.
National Science Foundation, Sea Grants Project Division and North Carolina Board of Science and Technology, Annual Report for 1969-70, May 15, 1970. 364 p, 167 fig, 80 tab, 81 ref, append. NSF Grant No GH-18.

Descriptors: *Estuaries, *Water pollution effects, *Biological communities, *Interfaces, *Foods, Ecosystems, Waste water (Pollution), Sewage, Salinity, Bacteria, Photosynthesis, Algae, Animals, Aquiculture, Artificial use, Model studies, North Carolina.
Identifiers: *Morehead City (NC), *Calico Creek (NC), Treated sewage, Energy circuit.

The test grounds of this study include a small estuary, Calico Creek (North Carolina), and three ponds which accept estuary water enriched in sewage after secondary treatment. Three control ponds receive tap water and estuarine water. The report provides in a graphic form salinity regime, photosynthetic productivity and respiration, concentration of phosphorus and nitrogen, and population dynamics of bacteria, algae, and animals. A possibility is advanced of attaining an interface system between municipal wastes and normal estuaries that would provide a medium for aquiculture and waste purification. (See also W71-06013 thru W71-06023) (Wilde-Wisconsin)
W71-06012

FUNGAL SURVEY IN WASTE PONDS AND CREEK,
North Carolina Univ., Chapel Hill. Dept. of Botany.
B. Rao, and W. Koch.

Studies of marine estuarine ecosystems developing with treated sewage wastes. National Science Foundation, Sea Grants Project Division and North Carolina Board of Science and Technology, Annual Report 1969-1970, p 287-310, May 15, 1970. 4 fig, 10 tab, 9 ref.

Descriptors: *Fungi, *Estuaries, Salinity, Water pollution effects, Biodegradation, Decomposing organic matter.
Identifiers: *Morehead City (NC), *Calico Creek (NC), Treated sewage, Phycomycetes, Ascomycetes, Deuteromycetes, Fungi imperfecti.

The study during June and July (1969) revealed the presence in the control and sewage-enriched waters 8 phycomycetes, 6 ascomycetes, and 7 fungi imperfecti species. Phycomycetes were largely confined to water and sediments, whereas other species, to plant material. Investigation revealed a pronounced effect of salinity on the growth of fungi. Control ponds had the greatest number of phycomycetes and lesser number of ascomycetes than polluted ponds; both types of basins had equal density of fungi imperfecti. A suggestion is made that fungi participate in decomposition of organic matter and aid in purification of waste. (See also W71-06012) (Wilde-Wisconsin)
W71-06013

CHARACTERISTICS OF SPARTINA MARSH WHICH IS RECEIVING TREATED MUNICIPAL SEWAGE WASTES,
North Carolina Univ., Chapel Hill. Dept. of Zoology.
David E. Marshall.
Studies of marine estuarine ecosystems developing with treated sewage wastes. National Science Foundation, Sea Grants Project Division and North Carolina Board of Science and Technology, Annual Report 1969-1970, p 317-356, May 15, 1970. 24 fig, 7 tab, 10 ref.

Descriptors: *Salt marshes, *Sewage effluents, Water pollution effects, Tidal marshes, Estuaries, Nutrients, Decomposing organic matter, Bacteria.
Identifiers: *Calico Creek (NC), *Morehead City (NC), Treated sewage, Spartina alternifolia, Littorina irrorata, Melampus bidentatus.

This study compared an effluent-fertilized and a natural salt marsh through an annual cycle. On the basis of general appearance, the waste receiving marsh in Calico Creek produced a higher biomass of Spartina alternifolia than the natural marsh, thus indicating a beneficial effect of fertilization. The augmented growth of Spartina and its rapid decay were paralleled by a high population of snails, particularly Littorina irrorata. The increased activity of bacteria and rate of decomposition of organic tissues is attributed to the release of nutrients by dead Spartina grass and Melampus snails. No significant difference was detected in the subsurface salinity of the two marshes. (See also W71-06012) (Wilde-Wisconsin)
W71-06014

MOLLUSCAN STUDIES,
North Carolina Univ., Chapel Hill; and North Carolina Univ., Morehead City. Inst. of Marine Sciences.
A. F. Chestnut.
Studies of marine estuarine ecosystems developing with treated sewage wastes. National Science Foundation, Sea Grants Project Division and North Carolina Board of Science and Technology, Annual Report 1969-1970, p 280-286, May 15, 1970. 5 fig.

Descriptors: *Mollusks, *Brackish water, Saline water, Hydrogen ion concentration, Clams, Water pollution effects, Oysters, Model studies.
Identifiers: *Calico Creek (NC), *Morehead City (NC), Treated sewage, Rangia cuneata, Crassostrea virginica, Mercenaria mercenaria, Aequipecten irradians.

The survival of mature clams, Rangia cuneata, indicated the extremely wide amplitude of tolerance of these organisms to reaction of water ranging from pH 3.0 to 10.0. The low salinity precluded the survival of hard clams, Mercenaria mercenaria, and bay scallops, Aequipecten irradians. Particular attention was given to the growth of common oyster, Crassostrea virginica. The mortality of mature oysters in polluted ponds was about 50% higher than that in control ponds. Both the survival and growth rate of oyster spat were appreciably higher in control ponds. (See also W71-06012) (Wilde-Wisconsin)
W71-06015

CRUSTACEANS AND FISHES IN THE SEA GRANT PONDS,
North Carolina Univ., Chapel Hill. Dept. of Environmental Science and Engineering.
Michael D. Beeston.
Studies of marine estuarine ecosystems developing with treated sewage wastes, National Science Foundation, Sea Grants Project Division and North Carolina Board of Science and Technology, Annual Report 1969-1970, p 272-279, May 15, 1970. 6 tab, 1 ref.

Descriptors: *Saline water, *Crustaceans, *Fish, Water pollution effects, Population, Growth rates, Sewage, Model studies.
Identifiers: *Calico Creek (NC), *Morehead City (NC), Treated sewage.

Several methods were used to sample crustaceans and fish in control and sewage-enriched ponds. Large shrimp, Benaeus aztecus and P duorarum, were found only in control ponds; small shrimp, Palaemonetes pugio, and blue crab, Calinectes sapidus, were present in all ponds. Spot, pinfish, croaker, flounder, silversides, and anchovies were found only in the control ponds. Spot was the only species caught in numbers sufficient to estimate its biomass. One of the control ponds harbored Aegathoa oculata, a crustacean parasitizing on anchovies. The fish population of waste ponds consisted largely of minnows, Fundulus heteroclitus being the predominant species. (See also W71-06012). (Wilde-Wisconsin)
W71-06016

CARBON,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
John Day.
In: Studies of marine estuarine ecosystems developing with treated sewage wastes, National Science Foundation, Sea Grants Project Divsion and North Carolina Board of Science and Technology, Annual Report 1969-1970, p 188-212, May 15, 1970. 19 fig, 5 ref.

Descriptors: *Carbon, *Brackish water, Water pollution effects, Carbon dioxide, Simulation analysis, Computer models, Sediments.
Identifiers: *Calico Creek (NC), *Morehead City (NC), Inorganic carbon, Organic carbon, Total carbon, Treated sewage, Carbon dioxide diffusion.

The ultimate aim of this study is to formulate a model of carbon flow in the system of control and sewage polluted ponds. These reservoirs were supplemented by mixing tanks. The rate of entry and drain were measured to calculate the carbon flux in aqueous phase. Carbon dioxide across the air-water interface was measured with an infrared gas analyzer. The loss of carbon was determined by analyses of sediments. The levels of total, inorganic, and organic carbon were recorded from July through November. Heavy algal blooms in July increased the organic carbon content. Both waste and control ponds showed a gradual decrease in the level of total carbon. The city water, obtained from a limestone aquifer, was very high in inorganic carbon. For most ponds, carbon dioxide diffused out of water almost continuously due to the high content of inorganic carbon in the feed water. (See also W71-06012). (Wilde-Wisconsin)
W71-06017

PHOSPHORUS FLUX BETWEEN WATER AND PLANKTON: A PRELIMINARY REPORT,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering; and North Carolina Univ., Morehead City. Inst. of Marine Sciences.
Edward J. Kuenzler, Henry McKellar, and Barbara Muse.
In: Studies of marine estuarine ecosystems developing with treated sewage wastes, National Science Foundation, Sea Grants Project Division and North Carolina Board of Science and Technology, Annual Report 1969-1970, p 180-187, May 15, 1970. 2 fig, 2 tab, 2 ref.

Descriptors: *Phosphorus, *Cycling nutrients, *Plankton, *Brackish water, Water pollution effects, Sewage, Chemical analysis, Adsorption, Model studies, Radioactivity techniques.
Identifiers: *Calico Creek (NC), *Morehead City (NC), Organic phosphorus, Inorganic phosphorus, Dissolved phosphorus, Mercury chloride, Formaldehyde, Treated sewage.

This investigation considered the effect of domestic wastes upon phosphorus cycling. Radiotracer technique was used to measure the flux of phosphorus from one compartment to another. The content of total phosphorus in waste ponds exceeding at times 60 microgram/liter, was generally much higher than that of control ponds. The relative rate of phosphorus uptake by plankton was directly proportional to particulate phosphorus and inversely proportional to dissolved inorganic phosphorus. The relative uptake rate in minutes and the turnover time in hours were calculated on the basis of the radioactivity of filtrate measured at different time intervals. Poisons, including formaldehyde and mercury chloride, were very efficient at low rates of uptake. (See also W71-06012). (Wilde-Wisconsin)
W71-06018

THE USE OF CARBON-14 FOR THE STUDY OF THE UPTAKE AND UTILIZATION OF PHYTOPLANKTON BY RANGEA CUNEATA,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
Roy Hyle, III.
In: Studies of marine estuarine ecosystems developing with treated sewage wastes, National Science Foundation, Sea Grants Project Division and North Carolina Board of Science and Technology, Annual Report 1969-1970, p 174-179, May 15, 1970. 6 tab, 5 ref.

Descriptors: *Estuaries, *Phytoplankton, *Mollusks, Clams, Cultures, Laboratory tests, Algae, Feeding rates, Model studies, Absorption, Water pollution effects, Radioactivity techniques.
Identifiers: *Morehead City (NC), *Calico Creek (NC), *Rangea cuneata, Oocystis parva, Nannochloris atomus, Carbon-14, Treated sewage.

The intent of this study is to establish utilization of Oocystis parva and Nannochloris atomus algae by filtering mollusks. Clams, Rangea cuneata, were placed in sea water diluted with distilled water to 15-20 o/oo. A sample of C-14 labelled phytoplankton was drawn and filtered at the beginning and end of feeding period. At the end of the feeding period, the clams were placed in a bowl of multipore filtered water and allowed to pump for several hours. Radioactivity of filters was determined with a Geiger counter and combusted tissue samples were counted with a Dynacon unit. The results suggested uptake and assimilation of algae by clams, but the data did not fit into the uptake-assimilation equations. (See also W71-06012). (Wilde-Wisconsin)
W71-06019

BENTHIC PRODUCTIVITY,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
Ronald Dillon, and William J. Woods.
In: Studies of marine estuarine ecosystems developing with treated sewage wastes, National Science Foundation, Sea Grants Project Division and North Carolina Board of Science and Technology, A
nual Report 1969-1970, p 133-143, May 15, 197
4 fig, 3 tab, 3 ref.

Descriptors: *Estuaries, *Benthos, *Productiviti
*Water pollution effects, Ponds, Model studie
Phytoplankton, Sewage, Oxygen, Respiratio
Light, Chrysophyta, Photosynthesis, Laborato
tests.
Identifiers: *Morehead City (NC), *Calico Cree
(NC), Light penetration, Treated sewage.

Benthic productivity was determined by light-dar
bottle technique in a simulated estuary of pollute
and non-polluted waters. To approach condition
observed in natural estuaries, submersible wate
pumps were mounted inside the jars. All contr
and one waste pond exhibited a positive net gros
production. On the other hand, two control an
two waste ponds showed positive net benthi
production. The low productivity of some ponds i
attributed to high turbidity and limited circulatio
coupled with high respiration. The erratic result
were caused by many rain squalls during the perio
of study. The introduction of pumps may have bee
an additional source of errors. No correlatio
between light energy and net or gross production o
all basins was disclosed. (See also W71-06012)
(Wilde-Wisconsin)
W71-06020

STUDIES ON ULVA AND OTHER BENTHONIC MARINE ALGAE RECEIVING TREATED SEWAGE IN PONDS AND IN CALICO CREEK AT MOREHEAD CITY, NORTH CAROLINA,
North Carolina Univ., Chapel Hill. Dept. o
Botany.
Charles F. Rhyne, and Max H. Hommersand.
In: Studies of marine estuarine ecosystems develop
ing with treated sewage wastes, National Science
Foundation, Sea Grants Project Division and North
Carolina Board of Science and Technology, An
nual Report 1969-1970, p 112-132, May 15, 1970
7 fig, 2 tab, 9 ref.

Descriptors: *Cytological studies, *Benthos
*Marine algae, *Estuaries, Saline water, Marine
plants, Cultures, Biomass, Salinity, Speciation,
Nutrients, Sewage, Model studies.
Identifiers: *Calico Creek (NC), *Morehead City
(NC), Treated sewage, Heteromorphic alteration,
Ulva, Enteromorpha.

Periodic observations of benthic macroscopic
marine algae in Calico Creek (North Carolina)
estuary and experimental control and sewage-en
riched ponds aimed to elucidate factors influencing
germination, growth and reproduction of Ulvaceae.
The predominant species included Ulva curvata,
Enteromorpha prolifera, and E linza. Germination
at the microscopic stage was triggered by tempera
ture from 5 to 15C, whereas further development
and reproduction required the minimum of 20C.
The normal growth and reproduction of Ulvacease
in ponds were hindered by low salinity (1.8%) and
a restricted light penetration. The species of Ulva
and Enteromorpha introduced on substrate of
oyster and scallop shells disappeared from the
ponds by the fifth month. However, a reoccurrence
of E prolifera was observed one year after its in
troduction. Attempts to obtain interspecific
hybrids have been unsuccessful. (See also W71-
06012). (Wilde-Wisconsin)
W71-06021

PHYTOPLANKTON POPULATIONS: A PRELIMINARY REPORT,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
Edward J. Kuenzler.
In: Studies of marine estuarine ecosystems developing with treated sewage wastes, National Science Foundation, Sea Grants Project Division and North Carolina Board of Science and Technology, Annual Report 1969-1970, p 94-111, May 15, 1970. 3 fig, 2 tab, 22 ref.

Descriptors: *Brackish water, *Water pollution effects, *Phytoplankton, Model studies, Estuaries, Population, Productivity, Nutrients, Sampling, Municipal wastes, Chlorophyll, Ponds, Sewage.
Identifiers: *Morehead City (NC), *Calico Creek (NC), Nutrient cycles, Chlorophyll a, Species composition, Nannochloris, Nitzschia, Cyclotella, Oocystis, Monodus, Chaetoceros, Treated sewage.

The dynamics of phytoplankton were investigated in three control and three sewage-enriched ponds. The sampling was confined to about 10 cm depth near the centers of the ponds. The dominant species in the control ponds were Nannochloris atomus, Nitzschia frustulum, N closterium, and Cyclotella caspia. The former three species reached density exceeding 100,000 cells/ml with maximum number of cells from June to December. The waste ponds harbored largely Oocystis parva, Monodus spp, Nitzschia closterium, N frustulum, and Chaetoceros gracile; most of these were abundant in fall and early winter, but Monodus bloom was striking in April. Both associations were accompanied by small forms of algae of 1-3 micron dimensions. There was generally a good agreement between the concentration of chlorophyll-a and cell counts in each pond. The composition of algal communities may represent only successional stages in a media which are only 18 months old. (See also W71-06012). (Wilde-Wisconsin)
W71-06022

FIRST YEAR RECORD OF TOTAL METABOLISM OF MARINE PONDS RECEIVING TREATED WASTES,
North Carolina Univ., Chapel Hill; and North Carolina Univ., Morehead City. Inst. of Marine Sciences.
Howard T. Odum, Charles Hall, and Sam C. Masarchia.
In: Studies of marine estuarine ecosystems developing with treated sewage wastes, National Science Foundation, Sea Grants Project Division and North Carolina Board of Science and Technology, Annual Report 1969-70, p 38-93, May 15, 1970. 7 fig, 2 tab, 5 ref.

Descriptors: *Metabolism, *Marine animals, *Photosynthesis, *Saline water, Respiration, Diurnal, Ponds, Aeration, Municipal wastes, Productivity, Interfaces, Ecosystems, Aquiculture, Food chains, Oxygen, Computer programs, Light, Hydrogen ion concentration, Model studies, Sewage.
Identifiers: *Calico Creek (NC), *Morehead City (NC), *Marine ponds, Variables patterns, Aeration coefficients, Insolation, Treated sewage.

Diurnal changes in oxygen concentration and corresponding calculated seasonal record of productivity are reported. Study of gas dynamics showed that aeration coefficient was less than 0.05 g carbon dioxide/sq m per hour/atmosphere partial pressure gradient of carbon dioxide. With limited diffusion the oxygen concentration was below 0.1 g/sq m per hour/0.2 atmosphere. The pond temperature followed the weather conditions and the temperature range served as an approximate radiometer for total insolation. The insolation in cal/sq cm was obtained as the difference between the ampere-hour meter readings taken at two intervals. When photosynthesis exceeded respiration, the oxygen reached a level of supersaturation and the reaction attained pH 10. The resulting replacement of carbonate alkalinity by hydroxide alkalinity was nontoxic to waterfowl. (See also W71-06012). (Wilde-Wisconsin)
W71-06023

SEASONAL VARIATIONS OF TEMPERATURE, DRIFT, AND HEAT EXCHANGE IN SURFACE WATERS OFF THE WEST COAST OF SOUTH AMERICA,
Scripps Institution of Oceanography, La Jolla, Calif; and Instituto Hidrografico de la Armada, Valparaiso (Chile).
Warren S. Wooster, and Hellmuth A. Sievers.
Limnology and Oceanography, Vol 15, No 4, p 595-605, July 1970. 10 fig, 9 ref.

Descriptors: *Water temperature, Heat balance, Water balance, Winds, Advection, Coasts.
Identifiers: Seasonal variation, Drift, Latitude.

Wyrtki's published and unpublished climatological data are used to describe seasonal variations of surface temperature, heat exchange, surface drift, and surface winds along the west coast of South America. Although there are well-marked seasonal and latitudinal changes in the heat flux through the sea surface, the heat flux south of 2S is always positive so that advective processes must play an important role in controlling surface temperature. Some general features of the coastal upwelling regime can be seen in an analysis of heat and water balances, but the fields of current velocity and wind stress are too poorly known for unequivocal quantitative results to be obtained. (Upadhyaya-Vanderbilt)
W71-06094

THERMAL DISCHARGE: A MODEL - PROTOTYPE COMPARISON,
Pacific Gas and Electric Co., Emeryville, Calif. Engineering Research Dept.
For primary bibliographic entry see Field 05B.
W71-06095

DEVELOPMENT OF AN INSTRUMENT FOR MEASURING THE CONCENTRATION OF DISSOLVED OXYGEN IN SEA WATER IN SITU,
Hawaii Inst. of Geophysics, Honolulu.
For primary bibliographic entry see Field 05A.
W71-06104

SANITARY CONTROL OF SHELLFISH IN KOREA,
Environment Control Administration, Cincinnati, Ohio. Water Supply and Sea Resources Program.
C. B. Kelly, R. J. Hammerstrom, J. B. Engle, Seong Jun Kim, and Kyung Man Bae.
Available from NTIS as PB-196 351, $3.00 in paper copy, $0.95 in microfiche. Agency for International Development, Washington, DC, 1968. 104 p, 12 ref.
Identifiers: *Aquaculture, *Korea, *Shellfish, Seafood, *Seafood, Sanitation, *Oysters, Sanitation, United States, Public health, Food control, Fisheries, Microbiology, Contaminants, Water pollution, Gastrointestinal diseases, Infectious diseases.

Report covers the public health aspects of establishing effective oyster production for export to the United States. Includes a review of oyster culture and production, shellfish administration and control activities, shellfish legislation, incidence of enteric diseases, laboratory services, sanitary surveys of oyster areas, research and training needs and control of harvesting.
W71-06110

WATER QUALITY OF THE DELAWARE RIVER ESTUARY, JULY THROUGH DECEMBER 1967,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05A.
W71-06156

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

STUDY AND EXPERIMENTS IN WASTE WATER RECLAMATION BY REVERSE OSMOSIS,
Gulf General Atomic Inc., San Diego, Calif.
For primary bibliographic entry see Field 05D.
W71-06025

SURVEY OF DESALTING PROCESSES FOR USE IN WASTE WATER TREATMENT,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05D.
W71-06042

STUDY OF MASS TRANSFER IN MEMBRANE PROCESSES,
California Univ., Berkeley. Sea Water Conversion Lab.
K. S. Spiegler.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $0.70. Office of Saline Water Research and Development Progress Report No 613, Jan 1971. 74 p, 2 tab, 20 fig, 18 ref, 4 append. OSW Contract 14-01-0001-1295.

Descriptors: Membranes, *Electrodialysis, *Reverse osmosis, *Ion transport, *Semipermeable membranes, *Membrane processes, Desalination, Electrochemistry, Pressure, *Mass transfer.
Identifiers: Water splitting, Streaming potential, Hydrodynamics.

Electrical potential differences across membranes were measured with both an anion-exchange membrane used in electrodialysis and a modified cellulose acetate membrane used in reverse osmosis. These measurements were performed in special apparatus which on the one hand simulated plant conditions hydraulically and electrochemically, and on the other permitted the measurement of a variety of other parameters pertinent to mass transfer (e.g. local current density, effluent concentration and effluent pH in electrodialysis, hyperfiltration rate and hyperfiltrate concentration in reverse osmosis). The results obtained point strongly towards confirmation of the original thesis viz., that electrical measurements can serve as important diagnostic tools in the study and in the control of these desalting methods. (Kindley-Office of Saline Water)
W71-06233

IMPROVEMENT OF THE CORROSION RESISTANCE OF ALUMINUM BRASS FOR USE IN SEA WATER CONVERSION PLANTS,
IIT Research Inst., Chicago, Ill.
For primary bibliographic entry see Field 08G.
W71-06234

Application of Iron-Aluminum Base Alloys to Saline Water Conversion,
Solar, San Diego, Calif.
For primary bibliographic entry see Field 08G.
W71-06235

RESEARCH ON PIEZODIALYSIS - Second Report,
Ionics, Inc., Watertown, Mass.
Frank B. Leitz, Samuel S. Alexander, Dirk M. deWinter, and Charles W. Plummer.
For sale by the SOD, GPO, Wash, DC, 20402, Price $0.65. Office of Saline Water Research and Development Progress Report No 620, December 1970. 66 p, 31 tab, 9 fig. OSW Contract 14-01-0001-611.

Descriptors: *Desalination, Aqueous solutions, Ions, *Ion exchange, Membranes, *Dialysis, *Membrane processes.
Identifiers: *Piezodialysis, Mosaic Membranes, Ion exchange membranes.

Piezodialysis is a promising new, coupled-transport process for desalination of aqueous solutions. In this process a hydrostatic head forces water and ions through regions of ion-exchange resins under conditions where a permeate enriched in salt is obtained. In November 1965 a project was undertaken in the laboratories of Ionics, Incorporated, to investigate some of the conditions

under which practical piezodialysis could occur and to prepare membranes which had intrinsic properties suitable for piezodialysis. The work concentrated on mosaic ion exchange membranes consisting of small regions of anion selective material interspersed with small regions of cation selective material, each such region extending substantially uniformly from one surface of the membrane to the other. Equations were developed for predicting the maximum value of salt enrichment and the maximum allowable current path length from resin transport coefficients. The measured transport properties of several ion-exchange resin formulations were shown to be promising for piezodialysis. Performance of a piezodialysis unit expressed as production rate per unit area and as fractional recovery as product, were found to be strongly dependent on average salt enrichment. While there is too much uncertainty for accurate economic prediction, an average of 5 should make the process roughly competitive with reverse osmosis. Performance of composite membrances from styrenized polyethylene resins gave considerable support to the prediction power of the mathematical analysis. Further work on membrane synthesis led to the development of the latex-polyelectrolyte membrane. With the best example of this type a salt enrichment factor greater than 5 was obtained. (See also W70-05081) (Johnson-Office of Saline Water)
W71-06236

BOUNDARY LAYER FLOW PROBLEMS IN DESALINATION BY REVERSE OSMOSIS,
California Univ., San Diego. Dept. of Aerospace and Mechanical Engineering Sciences.
F. A. Williams, T. J. Hendricks, and M. K. Liu.
For sale by the SOD, GPO, Wash, DC 20402, Price $1.75. Office of Saline Water Research and Development Progress Report No 622, December 1970. 230 p, 11 tab, 89 fig, 65 ref, 4 append. OSW Contract 14-01-0001-951.

Descriptors: *Desalination, *Reverse osmosis, Osmosis, Brines, *Boundary layers, Membranes, *Membrane processes, Separation techniques, *Desalination processes.
Identifiers: Concentration polarization, Boundary layer flow.

Buildup of excess salt concentration in brine adjacent to a reverse-osmosis membrane was studied experimentally and theoretically. An unstirred batch cell and a two-dimensional channel were investigated experimentally by electrical conductivity microprobes and shadowgraph techniques. These two systems and a semi-infinite flat plate were studied theoretically by perturbation methods, series expansion methods, asymptotic analyses, iterative techniques, linearization procedures, transform techniques and integral methods. Rejection-loss and diffusion-wave phenomena were identified theoretically. For the cell, experiments showed each theory holds within theoretically anticipated range of applicability; in an intermediate range of time and of ratio of osmotic to applied pressure, no theory agrees well with experiment. For the channel, experimental membrane salt concentrations agree well with predictions of an integral theory based on the experimentally verified assumption of an exponential excess concentration profile. The new integral theory can be applied easily in design calculations. Experimental observations of buoyant instability (membrane above brine) revealed convection patterns which possess wave lengths of a few millimeters and frequencies of a minute or two, for batch-cell and laminar-channel flow. Observations are correlated by convection-jet model. Buoyant convection greatly reduces average excess concentration and increases membrane flow rates. (Johnson-Office of Saline Water)
W71-06237

ECONOMICS OF COMBINING DISTILLED SEAWATER AND RENOVATED WASTE WATER AS A NEW SOURCE OF MUNICIPAL WATER SUPPLY,
Bechtel Corp., San Francisco, Calif.
J. W. Porter.
For sale by the SOD, GPO, Wash, DC 20402, Price $1.50. Office of Saline Water Research and Development Report No 617, October 1970. 97 p, 12 tab, 16 fig, 6 ref, 5 append. OSW Contract 14-01-0001-2161.

Descriptors: *Desalination, *Cost analysis, *Water reuse, *Evaluation, Model studies, *Municipal water, *Water supply, Waste water treatment, Economies.

A methodology for determining the preliminary economics of combining distilled seawater and renovated waste water to serve as a new source of municipal water supply was investigated and the results are reported. A computational procedure for determining least-cost supply from this combined source and alternative single sources was developed and is documented. The feasibility of the computational procedure (a mathematical model) is tested by application to a hypothetical U.S. coastal city. Appendices to the report include a description of the standard linear programming model (LP-600) used, discussion of the network theory applied, listings of computer sub-routines employed, verification of cost calculations and a list of cited references. (Miller-Office of Saline Water)
W71-06238

ION-SELECTIVE ELECTROCHEMICAL SENSORS,
Texas Instruments Inc., Dallas.
Isaac Trachtenberg, and Charles T. Baker.
Copy available from GPO Sup Doc, Wash, DC 20402, Price $1.00. Office of Saline Water Research and Development Progress Report No 496, December 1969. 105 p, 3 tab, 51 fig, 2 append. OSW Contract 14-01-0001-1737.

Descriptors: *Electrochemistry, *Analytical techniques, *Ions, Saline water, *Electrodes, Iron.
Identifiers: Ion selective electrodes, Non-oxide glass sensors, *Electrochemical sensors.

Several ion-selective electrochemical sensors prepared during the course of this research program have shown selective response to specific ions. The Fe (.....) sensors are the most promising sensors in this study. A chalcogenide glass (TI No 1173 - 28% Ge, 60% Se, 12% Sb) was doped with various amounts of Fe and Fe compounds. Sensors produced from this material yielded very selective response to Fe (.....), even in the presence of Fe (....). Response has been observed at concentrations as low as 0.000001 moles/liter (0.056 ppm). The preferred working range is 0.00001 to 0.01 moles/liter. The sensor has maintained its selectivity after five months in solution. The ability to reproduce the sensor has also been established. (See also W71-06240)
W71-06239

ION-SELECTIVE ELECTROCHEMICAL SENSORS - SECOND REPORT,
Texas Instruments Inc., Dallas.
Issac Trachtenberg, and Charles T. Baker.
For sale by the SOD, GPO, Wash, DC, 20402, Price $0.75. Office of Saline Water Research and Development Progress Report No 619, December 1970. 59 p, 32 fig, 3 tab, 10 ref, append. OSW Contract 14-01-0001-1737.

Descriptors: *Electrodes, *Analytical techniques, *Ions, Saline water, *Alkaline earth metals, Calcium, Magnesium, Metals, Electrochemistry, Iron, Sodium, Potassium, Sulfates.
Identifiers: Ion-selective electrodes, Non-oxide glass sensors, Solid state sensors, *Electrochemical sensors.

This is the second report on the ion-selective electrochemical sensor program; the first report was made in OSW R and D Progress Report No. 4 (See W71-06239). For the doped-1173 glass (.....) sensors, the redox potential for the reducing agent in the glass has been bracketed between 0.12 V and ..0.18 V. In addition, activation experiments revealed that the deterioration of potent response with time is related to a surface phenomenon (probably film formation). The variation in the rate of deterioration from one glass sample to the next was related to alterations in t preparation procedures. Simple chemical and/ mechanical treatment of the surface can restore t sensor almost to its original condition. Develo ment of solid state sensors for Ca (....) is anoth accomplishment made during this reporting perio Of this group, the 10% YF3-CaF2 polycrystalli membrane sensor exhibited the most favorab potential response characteristics, displaying theoretical Nernst response to the divalent catio of the alkaline earth metals (Ca (....), Mg (....), a Ba (....)). To the monovalent cations and oth divalent cations, the potential response was le than theoretical. The selectivity of the present se sors will limit their application to certain system When the ratio of divalent alkaline earth cati concentration to monovalent or other divalent c tion concentration was S0.1, little interference w noted. With higher interfering ion concentration however, the response to the alkaline earth catio was retarded or eliminated. This is the same type problem which plagues so many of the current commercially available ion-selective electrode (Horowitz-Office of Saline Water)
W71-06240

FIRST ANNUAL REPORT - OPERATION O THE MULTI-EFFECT MULTI-STAGE FLASH DISTILLATION PLANT (CLAIR ENGLE), SA DIEGO, CALIFORNIA.
Catalytic Construction Co., Philadelphia, Pa.

For sale by the SOD, GPO, Wash, DC, 20402 Price $3.25. Office of Saline Water Research an Development Progress Report No 596, Novembe 1970. 282 p, 48 tab, 55 fig, 4 append. OSW Con tract 14-01-0001-1297.

Descriptors: Operations and maintenance Management, *Flash distillation, *Desalination Development, *Desalination equipment, Hea exchangers, Pumps, Corrosion, Water treatment Deaeration, Evaporators, Operating costs, Design Scaling, *Desalination plants.
Identifiers: High temperature operation.

This document contains a general discussion con cerning the management, operation, maintenance physical plant, and information gained in the overall program of advancing the state of the art o desalting technology. The plant is a 1,000,000 gal lon per day, high performance, sea water desalina tion plant. The plant is designed to provide meaningful data concerning the design and opera tion of large desalination plants including such items as heat transfer, equipment and structura design, materials, cost of providing fresh water process engineering including high temperatur operation, operation of multi purpose plants, and equipment performance. (See also W71-06242) (Lohman-Office of Saline Water)
W71-06241

SECOND ANNUAL REPORT - OPERATION OF THE MULTI-EFFECT MULTI-STAGE FLASH DISTILLATION PLANT (CLAIR ENGLE), SAN DIEGO, CALIFORNIA.
Catalytic Construction Co., Philadelphia, Pa.

For sale by the SOD, GPO, Wash, DC 20402, Price $1.75. Office of Saline Water Research and Development Progress Report No 629, November 1970. 229 p, 25 tab, 32 fig. OSW Contract 14-01-0001-1803.

Descriptors: Operations and maintenance, Management, *Flash distillation, *Desalination, Development, *Desalination equipment, Heat

exchangers, Pumps, Corrosion, Water treatment, Deaeration, Evaporators, Operating costs, Design, Scaling, *Desalination plants.
Identifiers: High temperature operation.

This document contains a general discussion concerning the management, operation, maintenance, physical plant, and information gained in the overall program of advancing the state of the art of desalting technology. The plant is a 1,000,000 gallon per day, high performance, sea water desalination plant. The plant is designed to provide meaningful data concerning the design and operation of large desalination plants including such items as heat transfer, equipment and structural design, materials, cost of providing fresh water, process engineering including high temperature operation, operation of multi purpose plants, and equipment performance. (See also W71-06241) (Lohman-Office of Saline Water)
W71-06242

OAK RIDGE NATIONAL LABORATORY VERTICAL TUBE EVAPORATOR PILOT PLANT ANNUAL REPORT FOR FISCAL YEAR 1969.
Stearns-Roger Corp., Denver, Colo.

For sale by the SOD, GPO, Wash, DC, 20402, Price $1.00. Office of Saline Water Research and Development Progress Report No 600, August, 1970. 58 p, 14 tab, 12 fig, append. OSW Contract 14-01-0001-2535.

Descriptors: Distillation, *Evaporators, *Condensers, *Heat transfer, *Desalination processes, *Desalination plants.
Identifiers: Falling film evaporation, Spray nozzles.

A summary is presented of the down-flow heat transfer performance of enhanced surface tubes and operations at the four-effect Vertical Tube Evaporator Pilot Plant at the Office of Saline Water East Coast Test Station, Wrightsville Beach, North Carolina. The time period is from July 1, 1968 to June 30, 1969. Average overall heat transfer coefficients in the range of 1300-2100 Btu/hr. deg F sq ft were observed for double-fluted tubes during sustained runs. Summaries of overall heat transfer coefficients show deterioration, presumably from fouling tube surfaces, for selected data runs. Tube surface cleaning is shown to restore heat transfer performance to clean or original levels. For each effect, overall heat transfer coefficients of the enhanced surface tubes appear to be related to brine feed rate, expressed as evaporating brine flow Reynolds number. Overall heat transfer coefficients for each effect are shown to be related to the temperature level in each effect. Temperature variations in heat transfer coefficients can also be expressed in terms of brine Reynolds number. A general correlation for overall heat transfer coefficient, expressed as a function of brine Reynolds number, appears to predict flow and temperature variations in coefficients. Down-flow coefficients are shown to be essentially the same as up-flow coefficients. Operation problems encountered during the period are discussed. The acid injection and caustic neutralization system was used to control the deaerator-decarbonator exit pH to an average pH of 6.7 with a maximum deviation for any run of plus or minus .5 pH units. Dissolved oxygen levels were measured with Magna and Beckman oxymeters which were calibrated with Winkler tests. (See also W71-06244) (Callahan-Office of Saline Water)
W71-06243

OAK RIDGE NATIONAL LABORATORY VERTICAL TUBE EVAPORATOR PILOT PLANT - ANNUAL REPORT FOR FISCAL YEAR 1970.
Stearns-Roger Corp., Denver, Colo.

For sale by the SOD, GPO, Wash, DC, 20402, Price $1.25. Office of Saline Water Research and Development Progress Report No 618, October 1970. 158 p, 13 ref. OSW Contract 14-01-0001-2535.

Descriptors: Distillation, *Evaporators, *Condensers, *Heat transfer, Desalination processes, *Desalination plants.
Identifiers: Falling film evaporation, Spray nozzles.

Two long tube vertical falling film sea water evaporator pilot plants were operated at the Office of Saline Water, Wrightsville Beach Test Facility, Wrightsville Beach, North Carolina, during the period of July 1, 1969 thru June 30, 1970. The purpose of their operations was to produce accurate design data concerning heat transfer performance of enhanced surface evaporator tubes. Heat transfer coefficients at least twice smooth tube values, at similar conditions, was seen. Also performance was seen to vary directly with tube feed brine flow and inversely with antifoam level in the brine. The presence of surfactant marginally increased performance at high injection levels. The four effect train operated easily and successfully on the sump to sump mode of brine transfer. A multiphase ejector vapor compression pilot plant was completed and was ready for development testing at the end of the period. (See also W71-06243) (Callahan-Office of Saline Water)
W71-06244

SURVEY OF DESALTING PROCESSES FOR USE IN WASTE WATER TREATMENT,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05D.
W71-06268

3B. Water Yield Improvement

LAKE CHAMPLAIN IN RELATION TO REGIONAL WATER SUPPLY,
Vermont Univ., Burlington. Dept. of Zoology.
E. B. Henson, and Milton Potash.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 441-448, 1969. 8 p, 5 fig, 1 tab, 3 ref. OWRR Project A-014-VT (1).

Descriptors: *Water balance, *Water sources, *Water resources development, *Lakes, *New York, Water management (Applied), Water supply, Discharge (Water), Water yield.
Identifiers: *Lake Champlain (NY-Vt).

Lake Champlain is a deep glacial lake of the St. Lawrence drainage. It is the easternmost major contributor of fresh water to the St. Lawrence system before the St. Lawrence becomes brackish. Because of its large size (440 sq mi) and considerable depth (400 ft), Lake Champlain has been singled out as a potential regional water supply for the metropolitan areas of New England and New York City. An analysis has been made of the water budgets of the Lake to ascertain its reliability as a major water supply. The lake's outlet, the Richelieu River, has a mean outflow of 11,000 cfs, equivalent to 38% of the lake volume. The flow-through period amounts to only 2.6 years. Total input ranges from 25% to 55% of the lake volume, and the input correlates very closely with outflow, implying rapid displacement and short-term storage. Present municipal water use of the Lake amounts to 1% of the lake volume per year. Lake levels are usually at low stages when regional demands for water are greatest. It is recommended that water resource planners look to the more stable supplies of the Lake Ontario discharge as a reliable source of water or the region. (See also W71-05561) (Knapp-USGS)
W71-05875

RURAL WATER DISTRICTS--HERE IS WHY THEY ARE NEEDED,
Nebraska Univ., Lincoln. Agricultural Experiment Station.
For primary bibliographic entry see Field 06B.
W71-06061

SEVENTH BIENNIAL CONFERENCE ON GROUNDWATER (PROGRESS, PRACTICE, AND POTENTIAL OF GROUNDWATER RECHARGE, DEVELOPMENT AND MANAGEMENT).
For primary bibliographic entry see Field 04B.
W71-06117

POTENTIAL FOR STREAMFLOW AUGMENTATION BY GROUNDWATER PUMPING,
Miami Conservancy District, Dayton, Ohio.
For primary bibliographic entry see Field 04B.
W71-06118

OPPORTUNITIES FOR MODIFYING WEATHER TO AUGMENT PRECIPITATION AND SUPPRESS HAIL,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
Lewis O. Grant.
In: Frontiers in Conservation, Proceedings 24th Annual Meeting Soil Conservation Society of America, August 10-13, 1969, Colorado State University, Fort Collins, p 76-82, 1970. 7 p, 3 fig, 1 tab, 9 ref.

Descriptors: *Artificial precipitation, *Cloud seeding, *Precipitation (Atmospheric), *Colorado River Basin, Model studies, Water yield, Methodology, Rainfall, Hail, Clouds, Cloud cover, Meteorology, Climatology, Orography, Silver iodide, Coalescence.
Identifiers: Dry ice, Ice crystals.

Physical models have been developed that define conditions under which cloud seeding should have varying effects from artificial seeding of cold orographic clouds. The results of randomized artificial seeding experiments verify the conclusion that substantial increases in precipitation should be achieved when coldest cloud temperatures are in the range from about minutes 13 deg to minus 20 deg centigrade and that decrease might result when cloud temperatures are colder than about minus 26 deg centigrade. By considering the increases expected for cloud temperatures of minus 20 deg centigrade and warmer and the frequency of such occurrences in the Colorado River Basin, it is estimated that overall precipitation increases during the winter snowpack season should be 10 to 12% in the central and northern portions of the basin and 32 to 36% in the San Juan area of the southern portion of the basin. The investigations that have been carried out provide guidelines for conducting operational seeding for this type of cloud. (See also W71-06129) (Woodard-USGS)
W71-06132

THE SURFACE INSTRUMENT NETWORK OF THE UPPER COLORADO RIVER PILOT PROJECT,
Western Scientific Services, Inc., Fort Collins, Colo.
For primary bibliographic entry see Field 07A.
W71-06136

WATER CONSERVATION BY REMOVAL OF PHREATOPHYTES,
Geological Survey, Tucson, Ariz.
Richard C. Culler.
EOS, Transactions, American Geophysical Union, Vol 51, No 10, p 684-689, October 1970. 6 p, 11 fig, 6 ref.

Descriptors: *Phreatophytes, *Brush control, *Evapotranspiration control, *Water utilization, Land clearing, Water conservation, Flood plains, Land use, Watershed management, Hydrologic budget, Groundwater movement, Wildlife habitats.
Identifiers: *Gila River (Ariz.).

Evapotranspiration from the flood plain of a major river depletes water that otherwise might be available to downstream users. Removal of phreatophytes and replacing them with grasses hav-

ing a lower consumptive use can result in higher beneficial use of water, particularly in arid regions. Benefits of added grass as forage must be compared with the loss of brush as a wildlife habitat. Comparative data are presented from a study of the Gila River flood plain, Arizona, begun in 1963. Actual evapotranspiration is computed by the water-budget method. Instrumentation is described, and surface water and groundwater budgets are shown graphically. The computed evapotranspiration for 1964 is higher than for 1967. The average for the period used in this paper is 26,000 cu m (21 acre-feet) per day for 1964 and 16,000 cu m (13 acre-feet) per day for 1967, indicating that the water conveyance efficiency of the flood plain alluvium was improved by removing the brush. (Lang-USGS)
W71-06154

3C. Use of Water of Impaired Quality

EFFECT OF TIME OF EXPOSURE TO SALINITY ON GROWTH, WATER STATUS AND SALT ACCUMULATION IN BEAN PLANTS,
National and Univ. Inst. of Agriculture, Rehovoth (Israel). Volcani Inst. of Agriculture Research; and Hebrew Univ. Jerusalem (Israel).
For primary bibliographic entry see Field 02I.
W71-06074

SALINE ARTESIAN WATER AS A SUPPLEMENT,
Geological Survey, Miami, Fla.
Frederick W. Meyer.
Journal of the American Water Works Association, Vol 63, No 2, p 65-71, February 1971. 7 p, 10 fig, 9 ref.

Descriptors: *Water resources development, *National parks, *Florida, *Saline water, *Artesian wells, Confined water, Water quality, Salinity, Water chemistry, Hydrogeology, Water sources, Groundwater movement, Aquifer characteristics.
Identifiers: *Everglades National Park (Florida).

Large quantities of moderately saline water (less than 5,000-mg/liter dissolved solids) can be obtained from artesian water-bearing zones in the Avon Park Limestone of Eocene age--the top of which occurs at a depth of about 1,200 ft in southern Florida. Small quantities of less saline water can be obtained from artesian water-bearing zones in the Hawthorn, Tampa, and Suwannee Formations between 300 and 1,100 ft in depth. Artesian water could be used for small desalting plants in the Florida Keys and the Coastal Lowlands area at considerable savings over using sea water. The use of raw artesian water from below 1,300 ft for dry-weather biologic survival ponds in the Everglades, such as in the Everglades National Park, is infeasible because the salinity is too high for some species of plants and animals. Generally, piezometric levels, salinities, and flows increase with depth in southern Florida. (Knapp-USGS)
W71-06124

WATER USE BY COTTON FROM LOW AND MODERATELY SALINE STATIC WATER TABLES,
Agricultural Research Service, Weslaco, Tex., and Texas Agricultural Experiment Station, College Station.
L. N. Namken, C. L. Wiegand, and R. G. Brown.
Agronomy Journal, Vol 61, No 2, p 305-310, 1969. 4 tab, 4 fig, 11 ref.

Descriptors: *Consumptive use, *Lysimeters, *Saline water, *Water table, *Cotton, *Water conservation, Capillary action, Salinity, Groundwater, Moisture uptake, Water use, Crop production.
Identifiers: Irrigated crop.

Moderately saline static water tables occur in the semi-arid and arid southwestern United States, and reduce irrigation needs. A 4-year lysimeter study determined the contribution of shallow saline water on cotton yields on permeable soils. Controlled water tables at 91-, 183-, and 274-cm contributed 54.4, 26.4, and 17.3% of total water used under high-moisture treatment, and 60.6, 48.9, and 39.2% under low-moisture treatment. Soil profile depletion, rainfall, irrigations, and water-table additions comprised the total water. Water uptake from the 274-cm table was strongly related to capillary-zone salinity. Lint yields were related to total water and capillary-zone salinity. Moderate capillary-zone salinity (EC of 10 to 14 mmhos/cm) reduced monthly and seasonal water use compared with low salinity (EC of 2 to 3 mmhos/cm). High-moisture treatment delayed seasonal water use. Tables show moisture and water-table influences, and rainfall distribution. Figures show salinity and water-use distribution, monthly water table, and relation between cotton lint yields and water use. (Popkin-Arizona)
W71-06221

3D. Conservation in Domestic and Municipal Use

WATER RESOURCES OF NASSAU AND SUFFOLK COUNTIES,
Holzmacher, McLendon and Murrell, Melville, N.Y.
S. C. Mclendon.
Water and Sewage Works, Vol 118, No 2, p 34-36, February 1971. 3 p.

Descriptors: *Water resources development, *New York, *Groundwater, Water yield, Safe yield, Water quality, Water pollution sources, Nitrates, Aquifers, Water supply, Saline water intrusion.
Identifiers: *Long Island (NY), Nassau County (NY), Suffolk County (NY).

Water resources studies have been underway for some time and are nearing completion for both the Long Island, New York counties of Nassau and Suffolk. There is much similarity between the two counties with respect to water supply. The major differences appear in the eastern region of Suffolk County and to a lesser extent, in southwestern Nassau County. In Suffolk County, the estimated permissive sustained yield is 466 mgd. It is predicted that four of the ten towns in Suffolk County will have deficits before 2020. These are Babylon, Riverhead, Southold and East Hampton. A high percentage of the total permissive sustained yield could be withdrawn from the Magothy formation and will be necessary where Glacial supplies are not present or where the Glacial cannot be utilized because of unacceptable water quality. The widespread detection of detergents in the shallow formations in southern Nassau County and southwestern Suffolk County, and the more recent significant increases in nitrate concentrations in wells along the central portion of Nassau and western Suffolk, show that the population is polluting its drinking water supply. When the water supply quality is preserved, so is the water supply quantity. (Knapp-USGS)
W71-05843

3E. Conservation in Industry

REGENERATION OF THE SEVAN,
Army Foreign Science and Technology Center, Charlottesville, Va.
For primary bibliographic entry see Field 02H.
W71-06330

3F. Conservation in Agriculture

DEVELOPMENT OF WATER RESOURCES IN ASIA AND THE FAR EAST-REPORT OF THE NINTH SESSION OF THE BIENNIAL REGIONAL CONFERENCE ON WATT RESOURCES DEVELOPMENT.
Economic Commission for Asia and the Far E (UN), New York.
For primary bibliographic entry see Field 06B.
W71-05864

UREA CONVERSION TO AMMONIA WATERLOGGED SOILS,
Louisiana State Univ., Baton Rouge. Dept. Agronomy.
For primary bibliographic entry see Field 02K.
W71-05866

A PROGRAMMING MODEL FOR FARM I RIGATION SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering
James. S. Windsor, and Ven Te Chow.
Civil Engineering Studies, Hydraulic Engineerin Series, No 23, (UILU-ENG-71-2003), Decemb 1970. 95 p, 15 tab, 6 fig, 14 ref, 3 append. OWR Project B-030-ILL (3).

Descriptors: *Irrigation systems, *Optimizatic *Linear programming, *Dynamic programmi Planning, Irrigation, Irrigation efficiency, Co puter programs.

This report describes the development of a pr gramming model for farm irrigation systems. In t model, a multi-crop, multi-soil, farm irrigati system is broken down into a number of discre units, and then analyzed by means of a two-lev optimization approach. Dynamic programming used at the first level of optimization and line programming at the second level of optimizatio To show how the procedure may be set up on computer, a hypothetical two-crop, two-soil, far irrigation system is analyzed considering sever resource combinations.
W71-05923

PHYSIOLOGY OF BOLL SHEDDING IN CO TON: IV. CORRELATION STUDIES O FLOWER PRODUCTION AND BOL SHEDDING IN RELATION TO TEMPERATUR AND RAINFALL,
Indian Agricultural Research Inst., New Delhi.
S. N. Bhardwaj, P. N. Sharma, and R. B. Mehra.
Indian Journal of Agricultural Science, 1968, V 38, No 4, p 747-752. 4 tab, 1 fig, 5 ref.

Descriptors: *Cotton, *Crop production, *Plan physiology, *Flowering, Temperature, Rainfal Analysis, Varieties.
Identifiers: *Boll shedding.

Wide temperature and rainfall fluctuations occur the northern cotton-growing tract of India flowering in hirsutum varieties extends from July t mid-October. Flowering and boll shedding hav similar distinct peaks. Analysis of the effects temperature and rainfall on flower production an boll shedding was made at weekly intervals in 4 hir sutum varieties. Flowering and shedding wer found to be governed by interrelated internal an external factors. Flower production is governed b maximum and minimum temperatures and rainfal Moderate rainfall and mean maximum temperatur (28 to 33C) were most conductive for flowering Boll shedding is related to the number of flower produced. (Popkin - Arizona)
W71-06056

HOW TO SELECT AND APPLY ZINC FERTIL IZER,
Nebraska Univ., Lincoln. Agricultural Experimen Station.
R. C. Sorensen, E. J. Penas, and A. D. Flowerday.
Quarterly Serving Farm, Ranch and Home, Vol 17 No 1, Spring 1970, p 9-11. 5 fig.

Descriptors: *Fertilizers, *Calcareous soils *Nebraska, *Application methods, *Soil-water plant relationships, Carriers, Nutrients, Distribu

ition, Inorganic compounds, Organic compounds, Chelation, Leaching, Soil management, Climates, Costs, Soil erosion, Sierozems, Lime, Crop production, Acid soils, Oraganic matter.
Identifiers: *Zinc, Semi-arid lands.

Addition of zinc fertilizer to soils of low soil organic matter, high soil pH, lime-rich soil, and low soil zinc can increase crop yield. Semi-arid calcareous soils in irrigation-leveled or badly eroded sites in Western Nebraska are improved by zinc fertilizer. Though many fertilizers are available, soluble and finely-grained ones give even distribution and are most effective. Zinc fertilizers include organic chelates, organic non-chelates, soluble inorganics, and insoluble inorganics as carriers. Organic chelate has the best movement characteristics, though other carriers are effective if mixed with soil on application. Cost, climatic and management factors, other nutrient needs, application methods and carrier selection are outlined. Selection of the proper fertilizer depends primarily on distribution, mobility and cost. Figures show corn response to zinc fertilization, influence of particle size, placement and mobility, and distribution of 4 types of fertilizer in a leached soil column. (Popkin - Arizona)
W71-06059

PLANTING CORN IN NATIVE SOD,
Nebraska Univ., Lincoln. Agricultural Experiment Station.
D. E. Lane, and L. R. Robison.
Quarterly Serving Farm, Ranch and Home, Vol 17, No 1, Spring 1970, p 12-13. 2 fig, 4 tab.

Descriptors: *Planting, *Pasture management, *Erosion control, *Continuous farming, *Corn (Field), Soil management, Stabilization, Brush control, Herbicides, Grasses, Arid lands, Irrigation water, Soil erosion, Wind erosion, Nebraska, Vegetation establishment, Crop production.
Identifiers: Sand hills, Cole sod planter, Native sod, Parquat, Atrazine.

A continuous vegetation cover is needed in the Nebraska Sandhills because wind will erode the soil, even while irrigation water is applied. This problem is common to arid lands. Corn grown in grass that has top grass killed gives a continuous crop cover to prevent soil erosion. This is beneficial on light soils where spring and fall pasture could be used while corn becomes ensilage. Parquat- and atrazine-herbicide use and non-use produced crops, but the grassy control inhibited a good corn crop. Three pounds of atrazine and 1 pound of paraquat produced 18 bushels per acre more than 3 pounds atrazine and 1/2 pound paraquat, and 19 bushels per acre more than 3 pounds atrazine and 1/4 pound paraquat. Yields were comparable to conventional corn production. This approach is promising to wind-erodable areas. (Popkin - Arizona)
W71-06060

DEGRADATION OF WATER QUALITY IN IRRIGATION RETURN FLOWS,
Robert S. Kerr Water Research Center, Ada, Okla.; and Oklahoma State Univ., Stillwater. Dept. of Agronomy.
James P. Law, Jr., J. M. Davidson, and Lester W. Reed.
Oklahoma Agricultural Experiment Station, Bulletin B-684, October 1970. 26 p, 9 tab, 7 fig, 27 ref.

Descriptors: *Irrigation water, *Return flow, *Drainage water, *Deterioration, *Water pollution effects, Water quality, Salinity, Groundwater, Dissolved solids, Leaching, Salt balance, Percolating water, Pollution identification, Soil water, Saline water, Water conservation, Irrigation practices.
Identifiers: *Salt water irrigation, Salt transport.

The object was to determine water-quality degradation in irrigation return flows, to determine salinity status of a salt-water-irrigated clay loam soil, and to relate these results to irrigation returns on surface and groundwater quality. Total dissolved solids (TDS) increased 20% in the surface return flow, while percolating soil water increased 5 to 8 fold in TDS. The clay loam soil showed an increase in soluble salt after 15 years of high-salt-water irrigation (TDS of 1,430 ppm), though leaching by rain contributed a favorable salt balance. Percolating irrigation water transports about 10 tons of salt per acre-foot. Draining and percolating waters adversely affect surface and groundwater. Future studies will consider seasonal fluctuations and dynamics of soil water quality and quantity. Tables show water-table depths, water-sampling locations, schedule of operations, quality data of irrigation, drainage and groundwater, and estimated nutrient losses. Figures show salt content at time and depth of water. (Popkin - Arizona)
W71-06063

A COMPARISON OF WATER USE FOR HYBRID CORN IN THE BEKAA AND THE COASTAL PLAIN,
Agricultural Research Inst., Tal-Amara (Lebanon). Dept. of Irrigation.
A. Aboukhaled, and S. Sarraf.
Magon Institut de Recherches Agronimiques, Serie Technique, Publication No 12, Juin, 1970. 14 p, 3 fig, 5 tab, 8 ref.

Descriptors: *Lysimeters, *Corn (Field), *Soil moisture, *Evapotranspiration, *Irrigation efficiency, Semiarid climates, Evaporation, Solar radiation, Tensiometers, Moisture tension, Climatic data, Pans, Plant growth, Wind velocity, Water requirements, Temperature, Root systems, Moisture availability, Crop response, Advection.
Identifiers: *Lebanon, *Potential evapotranspiration, *Agroclimatology, *Moisture extraction, *Relative humidity, Class A pan, Neutron probes.

The water requirements of a hybrid corn (UH 146) were studied and compared in 2 major Lebanese agricultural areas, the central Bekaa Plain and the Northern Coast Plain (Abde). The prevailing climatic conditions (1969) in the 2 areas were compared in terms of potential evapotranspiration (PET), evaporation (E), solar radiation (R), relative humidity (RH) and wind velocity, and these were correlated with corn water use as measured by lysimeters. At the Abde site, planting occurred 1 month earlier (April) because of known climatic differences. Fertilizer applications were identical at the two sites. At the Bekaa site, 4 differing latin-square designed water schedules were applied on the basis of: (1) Readily available water in the root zone (2) Rate of water use (3) Soil moisture tension at 30 and 60 cm depth (4) Critical growth stages (tasseling to milk stage). The results showed that for similar yields, water use at Abde was about 60% of that in the Bekaa, with peak use reaching 7 mm/day at Abde and 11 mm/day at the Bekaa. The coastal water economy is due to the earlier planting, shorter growing cycle (20 days) and lower evaporative demand, resulting from an average 28% higher RH, 25% low R intensities and reduced wind velocities. In both areas corn water use exceeded measured PET during the critical growth period. The corn ET/class A pan E ratio was higher at the Bekaa due to advection on taller plants. About 4/5 of the total corn root moisture extraction occurred in the top 60-70 cm. soil layer. On the basis of this data, appropriate irrigation schedules are discussed for the 2 areas. (Casey - Arizona)
W71-06067

EFFECTS OF IRRIGATION INTENSITY AND NITROGEN LEVEL ON THE PERFORMANCE OF EIGHT VARIETIES OF UPLAND COTTON, GOSSPYIUM HIRSUTUM L.,
Arizona Agricultural Experiment Station, Yuma.
E. B. Jackson, and P. A. Tilt.
Agronomy Journal, Vol 60, No 1, p 13-17, 1968. 8 tab, 2 fig, 16 ref.

Descriptors: *Cotton, *Irrigation effects, *Nitrogen, *Plant growth regulators, *Irrigation efficiency, Crop production, Arizona, Soil moisture, Moisture uptake, Fibers (Plant), Fertilizers, Consumptive use.
Identifiers: *Lint.

Effects of 4 irrigation treatments and 2 nitrogen levels on performance of 8 upland cotton varieties were studied over a 3-year period on Glendale silty clay loam at Yuma, Arizona. Acala 44-10, Deltapine Smooth Leaf, DeKalb 220, Stoneville 7A, California Strains A and A-65, and Arizona Experimentals 221 and 6010 responded similarly to irrigation treatments. Highest yields were obtained under 14- to 21-day irrigation spacings with totals of 102 to 119 cm of water per season. 'Dry' irrigation treatments approached available soil moisture depletion before each irrigation and produced much lower yields for totals of 84.84 and 64 cm of water. Nitrogen (ammonium sulfate) treatments were most effective at 224 Kg N/ha with 14- to 21-day irrigations. No consistent treatment effect was found on lint percentage on fiber products. Tables show irrigation treatments and effects, statistical significance, and nitrogen effects and interaction. (Popkin - Arizona)
W71-06068

FORMATION OF THE THERMAL REGIME IN SOILS ON IRRIGATED FIELDS IN PERMAFROST REGIONS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Yakutsk (USSR).
For primary bibliographic entry see Field 02G.
W71-06070

THE WOODSMAN'S ASSAULTS ON THE DOMAIN OF THE CATTLEMAN,
Kansas Univ., Lawrence. Dept. of Geography.
Walter M. Kollmorgen.
Association of American Geographers, Annals, Vol 59, No 2, p 215-239, June 1969. 2 fig, 123 ref.

Descriptors: *Arid lands, *Land use, *Water resources development, *Federal government, Great Basin, Great Plains, Deserts, Legal aspects, Social aspects, Economic impact, Irrigation programs, Dry farming, Vegetation effects, Grazing, Desert Land Act, Weather modification, Grasslands, Environmental effects, Land management, Rainfall, Fallowing, Institutional constraints.
Identifiers: *Western U.S., *Cattle ranching, *Geographic perception, *Land alienation, Preemption Act, Homestead Act, Timber Culture Act, Kineaid Act, Enlarged Homestead Act, Stock-Raising Homestead Act.

The open, arid lands of the western U.S. were originally settled by large cattle operators. This land use ethic came into conflict with the cultural and social values of the eastern U.S. woodsman mentality, which in turn led to a century-long series of assaults by the woodsman on the cattleman's domain. The cattleman's survival was then determined by the extent to which he perjured himself and circumvented the intent and institutions of the woodsman, particularly as expressed by a series of congressional land alienation laws. The priori assumptions underlying the woodsman's position were: (1) Congressional incapability in dealing with western land problems, (2) cultural conflict, in which the ethic of small, family farm crop operations took precedence over large, partly nomadic operations and (3) geographic perceptions colored by eastern conditions which lead to misconceived land management attempts, abetted by congressional legislation, that proved inoperative in arid region grasslands. As examples of geographical ignorance, 3 major fallacious water supply concepts gained great currency at differing times and led to tragically misconceived programs. These include the theory that tree-planting increases areal rainfall, that irrigation was a panacea for widespread crop introduction and that dry land farming through fallowing was realistic. It is argued that such misconceptions still color our western land use policies and that governmental attempts to deal with the problem, even now, as in the past, result in confusion and chaos. (Casey - Arizona)
W71-06072

WATER QUALITY MANAGEMENT PROBLEMS IN ARID REGIONS.
Robert S. Kerr Water Research Center, Ada, Okla. Treatment and Control Research Program.
For primary bibliographic entry see Field 05G.
W71-06111

PROBLEMS OF POLLUTION OF IRRIGATION WATERS IN ARID REGIONS,
Utah State Univ., Logan, Dept. of Agricultural and Irrigation Engineering; and Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 05B.
W71-06112

YIELD REDUCTION BY CONTROLLED FLOODING OF CORN,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
W. F. Ritter, and C. E. Beer.
Americal Society of Agricultural Engineers Transactions, Vol 12, No 1, p 46-47, 50, 1969. 3 p, 1 fig, 2 tab, 6 ref. OWRR Project A-002-IA (3).

Descriptors: *Soil-water-plant relationships, *Crop response, *Corn (Field), *Flood damage, Experimental forms, Agriculture, Crop production, Fertilizers, Nitrogen compounds, Plant growth, Irrigation effects, Growth rates, Growth stages, Floodwater, Saturation, Test procedures, Irrigation practices.
Identifiers: *Controlled flooding, *Iowa State University.

An experiment was conducted at Iowa State University to evaluate flood damages to corn that was inundated for variable periods of time at different stages of growth. The controlled-flooding experiment was conducted on a floodplain soil with a permeable subsoil. Corn was inundated for 24, 48, and 72 hours, with approximately 6 inches of water maintained on the soil surface. Flooding treatment was applied when the corn was about 6 inches high, 30 inches high, and at the silking stage. Two different levels of nitrogen fertility were used on the plots. Results show that corn yields are affected most when flooding occurs at the early stage of growth (6 inches or less). The high-nitrogen and low-nitrogen plot yields were reduced by 20 and 35 percent, respectively, when the plots were inundated for 72 hours. There was also some reduction in yield after only 24 hours of flooding. At later stages of growth, there was little effect on flooding, except on the low-nitrogen plots flooded at the 30 inch height where yields were reduced by about 15 percent after inundation for 72 hours. (Woodard-USGS)
W71-06152

ESTABLISHMENT OF PERENNIAL FORAGES: I. SUBSEQUENT YIELDS; II. SUBSEQUENT ROOT DEVELOPMENT,
Iowa State Univ., Ames. Dept. of Agronomy.
D. R. Buxton, and W. F. Wedin.
Agronomy Journal, Jan-Feb 1970, Vol 62, No 1, Pt I, p 93-97; Pt II, p 97-100. 6 tab, 6 fig, 37 ref. Iowa Agricultural Journal Papers No J-6270 and J-6274.

Descriptors: *Forages, *Crop production, *Root development, *Plant groupings, *Weed control, Plant growth regulators, Soil-water-plant relationships, Growth rates, Weeds, Oats, Carbohydrates, Solar radiation, Alfalfa, Harvesting, Soil moisture, Fertility, Legumes, Rhizomes, Nutrients, Competition.
Identifiers: Sowing, Planting time, Root weights, Crownvetch, Birdsfoot trefoil.

This research examines the effects of weed control, oat companions with contrasting canopies and time of sowing on subsequent forage yields, and determines the effect of interspecies competition during growth on root weights and carbohydrate levels of perennial forages. Five establishment methods on yields of 6 perennial forages in 2 similar experiments with controls showed incident solar radiation was significantly greater under oat companion with less-dense conopy with mild weed competition. Alfalfa stands were less sensitive to interspecies competition than crownvetch and birdsfoot trefoil. Treatments in low tiller densities showed a rapid recovery by the second harvest with adequate moisture and fertility, dry summer sowing of alfalfa and 3 grasses resulted in greater yields. Interspecies competition has a greater effect on the upper 15-cm root legume yield and upper 10-cm root-rhizome grass yield than on forage yields. Lowest carbohydrate levels occurred in weeded swards when fertility and moisture were limiting factors. Minerals and water supplies by root systems were important to carbohydrate accumulation. Little differences in carbohydrate levels among treatments resulted when moisture and fertility were inadequate. Figures and tables quantify these relations. (Popkin-Arizona)
W71-06215

EFFECT OF IRRIGATION ON RECOVERY OF APPLIED NITROGEN BY COTTON,
Agricultural Research Service, Thorsby, Ala. Soil and Water Conservation Research Div.; and Auburn Univ., Ala. Dept. of Soils.
B. D. Doss, and C. E. Soarsbrook.
Agronomy Journal, 1969, Vol 61, No 1, p 37-40. 7 tab, 3 fig, 1 ref.

Descriptors: *Soil moisture, *Plant growth regulators, Root development, Fertilizers, Irrigation effects, Nitrogen, Cotton, Soil-water-plant relationships, Field capacity, Irrigation practices, Dry farming, Moisture uptake.
Identifiers: *Dry matter production, Irrigated crops.

Effects of soil moisture regime and nitrogen (N) rate on recovery of applied N by cotton were studied on a Greenville fine sandy loam. Irrigation increased total N uptake and decreased N percentage in plants. Applied N increased N percentage and total N uptake of plants, regardless of irrigation. Linear regression equations had slopes for N recovery on N applied for irrigated cotton twice as large as slopes for unirrigated cotton. Five years (1957 to 1959, 1965 to 1966) data for irrigated and unirrigated cotton fits the regression equation log Y equals 2.333 plus 0.727 log X, where Y is dry matter yield and X is N uptake. The cotton was grown at Thorsby (Alabama), where irrigation water was applied when 50% of available water was used in 60 cm of soil, and soil moisture and field capacity was measured gravimetrically. (Popkin-Arizona)
W71-06216

THE INFLUENCE OF VARIOUS SOIL MOISTURE-REGIMES ON THE YIELD AND QUALITY OF COTTON IN AN ARID ZONE,
National and Univ. Inst. of Agriculture, Rehovoth (Israel). Volcani Inst. of Agriculture Research.
J. Amir, and H. Bielorai.
Journal of Agricultural Science, Camb., 1969, Vol 73, No 3, p 425-429. 4 tab, 1 fig, 14 ref.

Descriptors: *Soil moisture, *Crop production, *Cotton, *Irrigation practices, *Plant growth regulators, Drought tolerance, Water requirements, Moisture stress, Flowering, Arid lands.
Identifiers: *Lint quality, *Irrigation intervals, *Drought symptoms, Irrigated crops, Cotton lint, Cotton balls, Coastal Negev (Israel), Israel.

Irrigation is necessary to obtain high cotton yields in arid regions. Various soil moisture regimes on cotton in the coastal Negev (Israel) were investigated. Three irrigation experiments in the western Negev showed that maximum yields of 1700 to 2100 kg/ha cotton can be obtained with 3 irrigations by increasing irrigation at the beginning of flowering. About 0.31 kg of lint was produced per cubic meter of irrigation water. No differences in lint quality was detected between moisture-stress and wet-treatment cotton. Additional irrigation increased number of bolls/plant as long as there were clear drought symptoms, while average boll weight remained unaffected. Average boll weight was s creased, though there was no increase in numbe bolls/plant, by additional irrigation treatme where there were no symptoms of water stre (Popkin-Arizona)
W71-06217

WATER USE BY COTTON FROM LOW AN MODERATELY SALINE STATIC WATER T BLES,
Agricultural Research Service, Weslaco, Tex., a Texas Agricultural Experiment Station, Colle Station.
For primary bibliographic entry see Field 03C.
W71-06221

SEED TABLETS FOR PRECISION PLANTIN LETTUCE,
Arizona Agricultural Experiment Station, Mesa.
B. L. Harriott.
Progressive Agriculture in Arizona, Vol 22, No Nov-Dec 1970, p 8-9. 1 tab, 4 fig, 1 ref.

Descriptors: *Seeds, *Planting, *Lettuce, *Wa conservation, *Application methods, Labor, Cr production, Feasibility, Treatment, Harvesti Mulching, Soil amendments, Irrigation efficien Arizona, Coatings, Control.
Identifiers: Irrigated crop, Seedbed preparatio Vermiculite, Tablets.

Lettuce is a major irrigated crop in Arizona. C timum planting of lettuce eliminates unnecessa labor, wasteful irrigation and conserves wat More than 60 variations of seedbed preparatio seed treatments, seed coatings, soil amendme and mulch applications were field evaluated sin 1964. Seeds encased in compressed vermicul disks prior to planting, and controlled spaci produced the largest emergence percentage (8 90%). Tableting can be done commercially for parts vermiculite, 2 parts water, 1 part polyvin acetate by weight, and compression to 1/4 origin volume. Pushing the tablet into a properly prepar clod-free seedbed accomplishes planting. Prop seed selection, treatment and tableting makes fea ble planting to a final stand and once-over harve ing. Tableting may be feasible where sta establishment or plant uniformity is needed f other crops. (Popkin-Arizona)
W71-06224

FERTILIZER MANAGEMENT FOR POLL TION CONTROL,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 05G.
W71-06437

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

HYDRODYNAMIC EFFECTS OF SEEPAGE O BED PARTICLES,
Utah State Univ., Logan. Dept. of Civil Enginee ing.
For primary bibliographic entry see Field 02J.
W71-05839

DEVELOPMENT OF WATER RESOURCES I ASIA AND THE FAR EAST-REPORT OF TH NINTH SESSION OF THE BIENNIAL RE GIONAL CONFERENCE ON WATE RESOURCES DEVELOPMENT.
Economic Commission for Asia and the Far Ea (UN), New York.
For primary bibliographic entry see Field 06B.
W71-05864

ATER RESOURCES DEVELOPMENT IN AOS.
conomic Commission for Asia and the Far East (N), New York.
or primary bibliographic entry see Field 06B.
71-05865

LOOD PLAIN INFORMATION, ELBA, LABAMA, PEA RIVER, WHITE WATER AND EAVER DAM CREEKS.
orps of Engineers, Mobile, Ala.

orps of Engineers Flood Plain Report, December 970. 33 p, 4 fig, 11 tab, 13 plate.

escriptors: *Floods, *Flood damage, *Flood lains, *Alabama, Regional flood, Flood forecast-ng, Flood control.
dentifiers: *Elba (Ala), Standard project flood, In-rmediate regional flood.

looding along the Pea River and Whitewater and eaver Dam Creeks at Elba, Coffee County, labama is described to aid in solving local flood roblems and in planning the best utilization of ood-prone lands. Maps, profiles, cross sections nd other material relating the extent of past flood-ng to floods which might occur in the future are ased on available records of rainfall, runoff, istorical flood heights and other technical data. he most intense storm ever recorded in the vicini-y of Elba occurred March 15, 1929. The official otal rainfall for the 15th was 20 inches and total or the storm was a record 29.60 inches. Recovered igh water mark at the highway bridge was 43.5 eet above the gage datum for an elevation of 202.7 eet above sea level. Only two persons lost their ives during this flood, which rose to a height 13.5 eet above damage stage. (Woodard-USGS)
W71-05867

LOOD PLAIN INFORMATION, CALLEGUAS REEK, VICINITY OF MOORPARK, VENTU-RA COUNTY, CALIFORNIA.
Corps of Engineers, Los Angeles, Calif.

Corps of Engineers Flood Plain Report, July 1970. 4 p, 18 fig, 6 tab, 19 plate.

Descriptors: *Floods, *Flood damage, *Flood plains, *California, Historic flood, Flood forecast-ng, Regional flood, Design flood, Flood control.
Identifiers: *Ventura County (Cal), Intermediate egional flood, Standard project flood.

looding along Calleguas Creek in Ventura Coun-y, California from mile 30.00 in the City of Simi alley, to mile 12.67 near Somis is described to aid n solving local flood problems and in planning the est utilization of flood-prone lands. Maps, rofiles, cross sections, and text material relating he extent of past flooding to floods which might ccur in the future are based on available records f rainfall, runoff, historical flood heights and other echnical data. The highest peak discharge ever ecorded in the study reach, 6,330 cubic feet per econd, was measured at the Strathearn bridge tream-gaging station from a drainage area of 78 quare miles on February 25, 1969. There was ex-ensive damage to agricultural property, to the loorpark Water Pollution Control Plant, and to lectrical and telephone utilities. A total of about 500,000 damage (1969 price levels) was ustained. The estimated discharge peak for the In-rmediate Regional flood at the Strathearn bridge age is 19,000 cfs, and for the Standard Project ood, 31,000 cfs. (Woodard-USGS)
71-05868

TREAMFLOW SYNTHESIS,
arvard Univ., Cambridge, Mass.
lyron B. Fiering.
ambridge, Harvard University Press, 1967. 139 p

escriptors: *Streamflow, Hydrology, *Simulation nalysis, Economic evaluation, Regression analysis, lonte Carlo method, Systems analysis, Risk, iscount rate.
Identifiers: *Reservoir design, *Storage-yield function, Decision theory, Objective function, Lagrangian method.

This book considers models of the water storage-yield relationship in order to determine the flow patterns associated with reservoir design. Early empirical solutions to the reservoir design or storage-yield problem are discussed in detail. As an approach to optimal reservoir design, the author uses operational hydrology to estimate system performance and benefit functions. An algorithm for optimal operation of a reservoir with deterministic flow is developed. Decision theory is then applied to operational hydrology to generate storage-yield functions. Case studies are cited to illustrate the efficiency of the operational hydrology and simulation in the design of water resource systems. The reservoir-storage-yield function establishes operational hydrology as an important tool in simulation as well as design. (Siegenthaler-Rutgers)
W71-05946

ALGAECIDAL EVALUATION AND ENVIRONMENTAL STUDY OF MAT PRODUCING BLUEGREEN ALGAE,
Bureau of Reclamation, Denver, Colo. Office of Chief Engineer.
Naman E. Otto.
Available from NTIS as PB-194 808, $3.00 in paper copy, $0.95 in microfiche. Bur of Reclam Report REC-OCE-70-25, June 1970. 27 p, 13 fig, 7 tab, 27 ref.

Descriptors: *Algae, *Aquatic weeds, *Weed control, Growth, *Cultures, *Algicides, Bibliographies, *Ecology, Aquatic life, Irrigation systems, Water analysis, Temperature, Limnology, Cyanophyta, Irrigation canals, Algal control.
Identifiers: *Algae culture technique, Aquatic weed study facility, Product evaluation, Blue-green algae.

Algaecidal tests of 74 compounds showed that only 9 were more active than copper sulfate, and one provided total control of the blue-green algae mat colonies. Results of preliminary algaecidal field tests with copper sulfate and admixtures of enhance activity are given. Observations of algaecidal treatments on an irrigation canal suggest that copper sulfate applications of 0.48 lb/cfs applied every 2 wk suppressed blue-green mat growth. Water temperature appears critical to treatment success. Results of studies conducted in 1967-1969 to determine environmental parameters of irrigation canals are presented. Data show that mat-type, blue-green algae grow in a wide range of water quality and temperature conditions and do not require enriched conditions for growth. Coloration substances in the water may influence the availability of micronutrient metals and may stimulate directly blue-green algae growth.
W71-06102

CANAL CAPACITY STUDIES MAIN CANAL COLUMBIA BASIN PROJECT,
Bureau of Reclamation, Denver, Colo. Office of Chief Engineer.
Mansil W. Scrivner.
Available from NTIS as PB-196 741, $3.00 in paper copy, $0.95 in microfiche. Bureau of Reclamation Report REC-OCE-70-31, July 1970. 128 p, 7 fig, 6 tab.

Descriptors: Canals, *Roughness coefficient, Open channel flow, *Flow resistance, *Analysis, Rigid linings, Trapezoidal channels, *Mannings equation, *Head loss, *Algae, Reaches (Distance), Horizontal curves, Research and development, Field data, Subcritical flow, Hydraulics, Chemicals, Washington, Fluctuation, Water surface, Field tests, *Hydraulic properties, Aquatic weeds.
Identifiers: Concrete linings, Main Canal, CBP, Wash, Columbia Basin Proj, Wash.

Additional tests were made during 1965, 1966, and 1967 on the Long Lake Reach of the Main Canal, Columbia Basin Project, to determine the hydraulic properties of the canal and the effect of aquatic growths during these years. Test methods and observation locations were the same as the 1963-64 studies. Filamentous algae growth was light to moderate and generally much below that observed during prior seasons. Fresh water sponge infestation was reported to be increasing. Flow resistance improvement after treatment of the canal with copper sulfate was not as great as had been anticipated. Two weeks after treatment, flow resistance returned to about pretreatment values.
W71-06109

FLOOD PLAIN INFORMATION, KINGFISHER AND UNCLE JOHN'S CREEKS, KINGFISHER, OKLAHOMA.
Corps of Engineers, Tulsa, Okla.

Corps of Engineers Flood Plain Report, January 1971. 35 p, 7 fig, 16 plate, 11 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Oklahoma, Regional flood, Flood forecasting, Flood control, Peak discharge, Rainfall-runoff relationships, Historic flood.
Identifiers: *Kingfisher (Okla), Standard project flood, Intermediate regional flood.

Flooding along Kingfisher and Uncle John's Creeks in the vicinity of Kingfisher, Oklahoma is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The greatest flood known to have occurred during recent history on Kingfisher and Uncle John's Creeks, occurred in June 1948. Although this flood did not produce the highest water elevations in some parts of Kingfisher, the discharge was greater than any other known flood on both creeks. Another great flood, in September 1961, was the second largest flood. The discharge was slightly less than the June 1948 flood. (Woodard-USGS)
W71-06119

FRONTIERS IN CONSERVATION.
For primary bibliographic entry see Field 04C.
W71-06129

THE SOCIAL AND ECONOMIC NEED FOR FLOODPLAIN REGULATION,
Soil Conservation Service, Denver, Colo.
Ronald I. Blewitt.
In: Frontiers in Conservation, Proceedings 24th Annual Meeting Soil Conservation Society of America, August 10-13, 1969, Colorado State University, Fort Collins, p 145-149, 1970. 5 p, 1 fig, 1 tab, 6 ref.

Descriptors: *Flood plains, *Flood damage, *Flood control, *Floods, *Flood plain zoning, Flood protection, Building codes, Abatement, Check structures, Drainage systems, Multiple-purpose projects, Water management (Applied), Colorado.

Floods cause over a billion dollars damage a year in the United States, and the damage is increasing in spite of an annual federal investment of over $500 million. Widespread storms over eastern Colorado in June 1965 caused more than $500 million damage; 21 people lost their lives. Unfortunately, the people living in the floodplain were probably unaware of the hazard under which they lived. No doubt they are now convinced that floodplain settlement should be regulated by zoning or that flood control structures should be built before people settle in floodplains. But then it would be difficult to justify them, and so a cycle of settlement, flood damage, and building costly control structures continues. One can see the tremendous need for multicounty organizations to properly plan and zone land not yet developed and to provide rights-of-way for control structures before their cost becomes ex-

cessive. Floodplains can be put to many uses other than residential, business, and industrial development. These include (1) greenbelts, (2) development of natural resources, (3) recreation, (4) highways, and (5) permissible occupation. (See also W71-06129) (Woodard-USGS)
W71-06131

SNOW AND RESERVOIR MANAGEMENT IN CANADA FOR THE COLUMBIA RIVER TREATY OPERATION,
British Columbia Hydro and Power Authority, Vancouver, Canada, Hydrology Branch.
For primary bibliographic entry see Field 02C.
W71-06134

THE DEVELOPMENT AND APPLICATION OF A HYDROLOGIC MODEL AS AN OPERATIONAL TOOL,
Sierra Hydrotechnology, Placerville, Calif., and California Cooperative Snow Surveys, Sacramento. Dept. of Water Resources.
For primary bibliographic entry see Field 02C.
W71-06135

USING ALL AVAILABLE HYDROLOGIC DATA,
British Columbia Water Resources Service, Vancouver; and British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W71-06138

THE DESCHUTES RIVER HYDROGRAPH FORECAST,
Soil Conservation Service, Portland, Oreg.
Tommy A. George.
Proceedings 38th Annual Meeting of Western Snow Conference, April 21-23, 1970, Victoria, British Columbia, Canada: Printed by Colorado State Univ, Fort Collins, p 68-73, 1970. 6 p, 9 plate, 1 tab, 4 ref.

Descriptors: *Streamflow forecasting, *Hydrograph analysis, *Oregon, Water management (Applied), Snowmelt, Water rights, Regression analysis, Irrigation water.
Identifiers: *Deschutes River (Oreg).

This paper explains the procedure used to forecast critical flow levels and the dates that these levels will occur on the Deschutes River at Bend, Oregon. The value of the forecast to water users in relation to their water rights, and the problems involved in reconstructing the streamflow hydrograph used in deriving the forecast equations are discussed. Examples of forecasted versus actual hydrographs for the past several years are included. The information is used by the watermaster and irrigation districts in managing the river and their water use. (See also W71-06133) (Knapp-USGS)
W71-06144

PHYSICAL PROPERTIES AND PROCESSING CHARACTERISTICS OF MACROPHYTES AS RELATED TO MECHANICAL HARVESTING,
Wisconsin Univ., Madison. Water Resources Center.
H. D. Bruhn, D. F. Livermore, and F. O. Aboaba.
Available from NTIS as PB-198 129, $3.00 in paper copy, $0.95 in microfiche. Reprint, American Society of Agricultural Engineers, St Joseph, Michigan 49085, Paper 70-582, 1970. 17 p, 12 fig, 30 ref. OWRR Project B-018-WIS (2).

Descriptors: *Harvesting of algae, *Aquatic weed control, *Mechanical control, *Dewatering.
Identifiers: Farm machinery, Industrial machinery, Utilization, Modification.

Selective mechanical harvesting of undesirable aquatic vegetation appears to be a feasible and ecologically sound approach to control in recreational waters. The transportation from the harvest area to the disposal site is a major expense in the overall harvest operation. Since aquatic vegetation is approximately 90 per cent water processing and dewatering this material as a part of the initial harvesting operation greatly facilitates its transportation and ultimate disposal or utilization. Intensive mechanical dewatering based on procedures developed in this research results in reducing the fibrous fraction of aquatic vegetation to 16 per cent of its original volume and 32 per cent of its original weight, while removing from the harvested area 90 per cent of the original dry matter, 85 per cent of the protein, 60 per cent of the potassium, and 80 per cent of the phosphorus present in the growing vegetation. The reduction in fiber length resulting from the dewatering process increases the ease with which the vegetative material can be transferred through conveying systems thus further facilitating handling and disposal. The major portion of the equipment required for the preprocessing and dewatering can be developed by utilization and modification of components of all readily available farm and industrial machinery.
W71-06188

WATER RELATED LAND USE IN THE BEAR RIVER DRAINAGE AREA,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 07C.
W71-06212

WATER RELATED LAND USE IN THE UTAH LAKE DRAINAGE AREA,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 07C.
W71-06213

HYDROLOGIC INVENTORY OF THE UTAH LAKE DRAINAGE AREA,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 02E.
W71-06218

HYDROLOGIC INVENTORY OF THE UINTAH STUDY UNIT,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 02E.
W71-06219

HYDROLOGIC INVENTORY OF THE WEBER RIVER STUDY UNIT,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 02E.
W71-06220

THE SAN SIMON WATERSHED: REVEGETATION,
Arizona Univ., Tucson. Dept. of Watershed Management; and Arizona Agricultural Experiment Station, Tucson.
For primary bibliographic entry see Field 04D.
W71-06223

PINYON-JUNIPER CONTROL: WHERE, WHY,
Arizona Univ., Tucson. Dept. of Watershed Management; and Arizona Univ., Tucson. Dept. of Range Management.
For primary bibliographic entry see Field 04D.
W71-06225

FLOOD PLAIN INFORMATION, ONTONAGON RIVER, ONTONAGON, MICHIGAN, AND LAKE SUPERIOR SHORELINE, ONTONAGON COUNTY, MICHIGAN.
Stanley Consultants, Inc., Muscatine, Iowa.

Corps of Engineers Flood Plain Report, September 1970. 120 p, 67 fig, 26 plate, 7 tab.

Descriptors: *Floods, *Flood damage, *Michigan, *Beach erosion, *Lake Superior, Flood plains, Regional flood, Flood forecasting, Flood cont
Sediment transport, Historic flood.
Identifiers: *Ontonagon County (Mich), Stand
project flood, Intermediate regional flood.

The flood situation along the Ontonagon Rive
the vicinity of Ontonagon, Michigan, and be
erosions along Lake Superior for the Ontona
County shoreline are described to aid in solv
local flood problems and in planning the
utilization of flood-prone lands. Maps, profi
cross sections, and text material relating the ext
of past flooding to floods which might occur in
future are based on available records of rainfall,
noff, historical flood heights and other techn
data. Analysis indicates that the extent of eros
by the year 2020 for the Ontonagon Cou
shoreline along Lake Superior may be as much
150 feet of shoreline. (Woodard-USGS)
W71-06232

A CRAZY IDEA ON URBAN WATER MANAG MENT,
Pennsylvania State Univ., Unversity Park. Dept
Civil Engineering.
For primary bibliographic entry see Field 06B.
W71-06309

DRAINAGE OF WIDE ROAD PAVEMENTS,
For primary bibliographic entry see Field 08A.
W71-06368

STUDIES ON THE CHEMICAL CONTROL TREE ROOTS IN SEWER LINES,
O. A. Leonard, and Neal Townley.
Paper presented at the Calif WPCA 42nd Ann
Conference, Sacramento, Calif, April 29 to May
1970.

Descriptors: *Sewers, *Laboratory tests, *R
systems.
Identifiers: *Tree roots, Sewer hydraulics.

This study was a cooperative effort by the auth
and Dr. Ahrens of the Connecticut Agricultural
periment Station. The problem was studied
Davis and the Utilities Division of Sacramento
growing wood plants in pots filled with a pott
mix which were placed on open cans. Roots whi
grew into cans were treated for periods of time
solutions of different chemicals. The most prom
ing treatments were examined in a single test
July 1969 in the sewer lines of Sacramento Coun
All treatments were effective in killing the roots
the lines but some were more effective than oth
in killing roots in and outside of joints. Studies
being continued to evaluate factors influencing k
cost, and safety to trees.
W71-06397

HERBICIDE RESIDUES IN AGRICULTURA WATER FROM CONTROL OF AQUATIC A BANK WEEDS,
Agricultural Research Service, Denver, Colo. Cr
Research Div; and Agricultural Research Servic
Laramie, Wyo. Crops Research Div.
For primary bibliographic entry see Field 05B.
W71-06440

4B. Groundwater Management

WATER RESOURCES OF NASSAU AND SU FOLK COUNTIES,
Holzmacher, McLendon and Murrell, Melvil
N.Y.
For primary bibliographic entry see Field 03D.
W71-05843

WATER RESOURCES OF THE HEBE KAMAS-PARK CITY AREA, NORTH-CENTRA UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 02E.

W71-05852

GROUNDWATER RESOURCES OF THE LOYSVILLE AND MIFFLINTOWN QUADRANGLES IN SOUTH-CENTRAL PENNSYLVANIA,
Geological Survey, Harrisburg, Pa. Water Resources Div.
Herbert E. Johnston.
Copies may be purchased from Bureau of Publications, Tenth and Market Streets, Harrisburg, Penn. 17125. Pennsylvania Geological Survey Fourth Series Bulletin W-27, 1970. 96 p, 12 fig, 2 plate, 14 tab, 23 ref.

Descriptors: *Water resources, *Groundwater, Pennsylvania, *Hydrologic data, *Data collections, Water wells, Hydrogeology, Geology, Aquifers, Aquifer characteristics, Water yield, Specific capacity, Water quality, Chemical analysis, Topography, Water utilization, Consumptive use, Meteorology, Evaluation, Water resources development, Hydrology, Maps.
Identifiers: *South-central Pennsylvania, *Groundwater resources, Test holes, Well logs.

The Loysville and Mifflintown quadrangles include an area of about 460 square miles of valley and ridge terrain in south-central Pennsylvania. This area is underlain by strongly folded sedimentary rocks that consist chiefly of sandstone, siltstone, shale, and limestone of Ordovician, Silurian, and Devonian age. Yields reported for more than 500 wells ranged from less than 1 gpm to 275 gpm; the median yield was 12 gpm. Fewer than 5% of the wells were reported to yield more than 50 gpm, and fewer than 3% were reported to yield less than 1 gpm. Evaluation of reported-yield data, specific-capacity data, and borehole-flow data from the deepest wells inventoried indicate that the principal yielding zones generally occur above a depth of about 200 feet. Water from calcareous shales and limestones generally has a dissolved-solids content of 200 to 300 mg/liter and the water is generally hard to very hard. Water from the noncalcareous shales, siltstone, and sandstones generally has a total dissolved-solids content of 100 to 200 mg/liter, and is generally soft to moderately hard. (Woodard-USGS)
W71-05853

GEOCHEMICAL SURVEY OF MISSOURI, PLANS AND PROGRESS FOR SECOND SIX-MONTH PERIOD (JANUARY-JUNE, 1970).
Geological Survey, Denver, Colo. Regional Geochemistry Branch.
For primary bibliographic entry see Field 02K.
W71-05854

WATER-RESOURCES APPRAISAL OF THE COLUMBUS SALT MARSH-SODA SPRING VALLEY AREA, MINERAL AND ESMERALDA COUNTIES, NEVADA,
Geological Survey, Carson City, Nev.
D. S. Van Denburgh, and Patrick A. Glancy.
Nevada Division of Water Resources, Water Resources-Reconnaissance Series Report 52, 1970. 16 p, 2 fig, 17 tab, 26 ref, 9 photo.

Descriptors: *Water resources, *Great Basin, Nevada, *Hydrologic data, Data collections, Groundwater, Surface waters, Evaluation, Aquifer characteristics, Water yield, Water quality, Chemical analysis, Withdrawal, Water wells, Runoff, Evapotranspiration, Storage, Groundwater recharge, Geology, Consumptive use.

The 1,940-square-mile area covered by this study area lies in the southwestern part of the Great Basin in Nevada and encompasses 13 valleys. Altitudes in the area range from 4,370 feet on the floor of Rhodes Salt Marsh Valley to 13,140 feet at the crest of Boundary Peak. Precipitation averages 3-6 inches at the lower altitudes and 20 inches or more in the highest mountain areas. The growing season (based on a minimum temperature of 28 deg F) average 170-200 days on the lower valley floors, and less than 100-150 days at higher altitudes. The quantitative hydrologic character of each valley is summarized. Wells yield groundwater solely from the alluvium at depths that generally range from 30 to 300 feet. Groundwater withdrawals are minor (less than 5-10 acre-feet per year) in all but eastern Soda Spring Valley, where they are about 30 acre-feet per year. The chemical character of water in the report area is highly variable, even within a single valley. Groundwater in Columbus and Rhodes Salt Marsh Valleys is the least suitable for domestic and agricultural use, whereas most water in the other valleys is generally acceptable. In some places, excessive fluoride is or may be a problem for domestic use. (Woodard-USGS)
W71-05862

RECONNAISSANCE INVESTIGATION OF THE SUBSIDENCE OF VENICE AND SUGGESTED STEPS TOWARD ITS CONTROL,
Geological Survey, Sacramento, Calif.
For primary bibliographic entry see Field 02F.
W71-05870

COMPUTER METHODS FOR TRANSIENT ANALYSIS OF WATER-TABLE AQUIFERS,
Ohio State Univ., Columbus. Water Resources Center.
For primary bibliographic entry see Field 02F.
W71-05920

RURAL WATER DISTRICTS--HERE IS WHY THEY ARE NEEDED,
Nebraska Univ., Lincoln. Agricultural Experiment Station.
For primary bibliographic entry see Field 06B.
W71-06061

SEVENTH BIENNIAL CONFERENCE ON GROUNDWATER (PROGRESS, PRACTICE, AND POTENTIAL OF GROUNDWATER RECHARGE, DEVELOPMENT AND MANAGEMENT).

Copies available from Univ. of California, Water Resources Center, Los Angeles, Calif. 90024 - Price $3.00 each. Proceedings 7th Biennial Conference on Groundwater, held at University of California, Los Angeles, September 10-11, 1969: Los Angeles, California University Water Resources Center Report No 18, 1970. 235 p, append.

Descriptors: *Groundwater, *Water supply, *Conferences, *California, Water yield, Water resources development, Water demand, Water utilization, Aquifers, Water wells, Pumping, Water costs, Conjunctive use.
Identifiers: *University of California at Los Angeles.

These conference proceedings included presentations and panel discussions of technical papers pertaining to groundwater hydrology. Topics include progress on the Institutional front; progress on the technical front; new approaches and techniques; framework of the future; and needs of the future. Papers related to new approaches and techniques emphasize streamflow augmentation by groundwater utilization. This has already been operated in the Thames River Basin in England and the Great Miami River Basin in Ohio (U.S.A.). Pertinent information of water balance, water demand, water yield, and water costs is included. (See also W71-06118) (Woodard-USGS)
W71-06117

POTENTIAL FOR STREAMFLOW AUGMENTATION BY GROUNDWATER PUMPING,
Miami Conservancy District, Dayton, Ohio.
Richard F. Thomas.
In: Proceedings 7th Biennial Conference on Groundwater, held at University of California, Los Angeles, September 10-11, 1969: Los Angeles, California University Water Resources Center Report No 18, p 73-92, 1970. 20 p, 3 fig, 2 tab, 5 ref.

Descriptors: *Conjunctive use, *Water resources development, Ohio, *Low-flow augmentation, *Groundwater, Water yield, Water demand, Water utilization, Water costs, Aquifers, Pumping, Water wells, Water supply, Streamflow.
Identifiers: *Streamflow augmentation, *Great Miami River Basin (Ohio).

The characteristics of the potential groundwater augmentation scheme for the Great Miami River in Ohio include: (a) An average annual demand of about 30,000 acre-feet; (b) a one in 10-year demand of 64,500 acre-feet; (c) one in 10-year pumping rate of 280 cfs with a nearly linear distribution from 1 to the maximum rate for the critical period of 280 days; (d) Well field containing 92 wells; and (e) Wells 18 inches in diameter, 150 feet deep, and 500-foot apart. Preliminary estimates of cost of the groundwater pumping scheme are $3.5 to $5 million. A comparable surface reservoir would cost a minimum of $30 million. In the Great Miami River Basin glacial outwash deposits form the best aquifers. Outwash deposits fill the buried valleys to a thickness of 100 to 250 feet in the main valleys and to generally less than 100 feet in the tributary valleys. Individual wells near a stream can yield up to 3,000 gallons per minute, while wells not receiving induced recharge yield 500 to 1,000 gpm. Total water storage in the buried valley system along the Great Miami, the Stillwater and Mad Rivers is approximately 6,500,000 acre-feet. (See also W71-06117) (WOoodard-USGS)
W71-06118

VENICE IS SINKING INTO THE SEA,
Electroconsult, Milan (Italy).
For primary bibliographic entry see Field 02F.
W71-06120

AVAILABILITY OF GROUNDWATER IN CHARLES COUNTY, MARYLAND,
Maryland Geological Survey, Baltimore.
For primary bibliographic entry see Field 02F.
W71-06168

AVAILABILITY OF GROUNDWATER IN DECATUR COUNTY, IOWA,
Geological Survey, Iowa City, Iowa.
For primary bibliographic entry see Field 02F.
W71-06175

SEEPAGE FACE EFFECTS IN UNSTEADY GROUNDWATER FLOW,
Wisconsin Univ., Madison. Water Resources Center; and Wisconsin Univ., Madison. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W71-06190

WATER USE BY COTTON FROM LOW AND MODERATELY SALINE STATIC WATER TABLES,
Agricultural Research Service, Weslaco, Tex., and Texas Agricultural Experiment Station, College Station.
For primary bibliographic entry see Field 03C.
W71-06221

WELL RECORDS, DEPTH-TO-WATER MEASUREMENTS, CHEMICAL ANALYSES OF GROUND WATER, DRILLERS LOGS, AND ELECTRIC-LOG INFORMATION IN HEMPSTEAD, LAFAYETTE, LITTLE RIVER, MILLER, AND NEVADA COUNTIES, ARKANSAS,
Geological Survey, Little Rock, Ark.
J. W. Stephens.
Geological Survey Report, 1970. 197 p, 6 fig, 25 tab.

Descriptors: *Groundwater, *Water resources development, *Hydrologic data, *Data collections, *Arkansas, Water wells, Drill holes, Aquifers, Aquifer characteristics, Water yield, Water levels,

Water quality, Chemical analysis, Logging (Recording), Water utilization, Consumptive use.
Identifiers: *Southwest Arkansas, Well logs, Well data, Well depth.

This report is a compilation of hydrogeologic data collected during a water-resources investigation of Hempstead, Lafayette, Little River, Miller, and Nevada Counties, Arkansas. The data have been prepared for use in planning water-resources development in the area. Most of data were collected between January 1967 and October 1968, and includes records of 479 wells and test holes; results of chemical analyses of water samples from 197 wells; electric-log information from 131 locations; lithologic logs of 126 wells and test holes; and measurement of water levels in 149 wells. (Woodard-USGS)
W71-06229

ARTIFICIAL RECHARGE PRACTICES IN HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
David R. Hargis, and Frank L. Peterson.
Available from NTIS as PB-198 233, $3.00 in paper copy, $0.95 in microfiche. Technical Report No 43, October 1970. 36 p, 4 tab, 9 fig, 22 ref. OWRR Project A-028-HI (1).

Descriptors: *Hawaii, *Artificial recharge, Groundwater, Water spreading, Wells, Shafts (Excavations), Irrigation, Cesspool, Seepage, Ditch, Pit recharge.
Identifiers: Ditch leakage.

Artificial recharge practices in Hawaii include stream-water recharge through wells and shafts, storm drainage disposal through wells and pits, induced leakage from ditches and reservoirs and deliberate spreading of excess irrigation water, incidental ditch and reservoir leakage and other nondeliberate recharge of irrigation water, and cesspool seepage. The most significant source of artificial recharge to groundwater bodies in Hawaii is probably recharge incidental to irrigation. Deliberate artificial recharge to groundwater bodies consists of wells recharging stream water at Hanapepe, Kanuai and Puukapu, Hawaii, wells and pits which dispose of storm drainage at Wailuku and Kahului, Maui and Hilo, Hawaii, and excess irrigation water by induced leakage from ditches and reservoirs and water spreading over fields and in gulches at Hawaiian Commercial and Sugar Company on the East Maui isthmus. In addition, the Department of Land and Natural Resources of the State of Hawaii will begin disposal of treated sewage through three deep wells at Waimanalo, Oahu as soon as sewerage is completed.
W71-06263

AN ECONOMIC ANALYSIS OF THE INTERTEMPORAL ALLOCATION OF GROUNDWATER IN THE CENTRAL OGALLALA FORMATION,
Oklahoma State Univ., Dept. of Agricultural Economics.
Solomon Bekure.
Ph.D. Dissertation, May 1971. 227 p, 5 fig, 56 tab, 28 ref, 7 append. OWRR Project A-010-OKLA (1).

Descriptors: *Allocation, *Models, Crop production, Water table, Groundwater, Withdrawal, Linear programming, *Economic impact, *Natural resources, *Water utilization, Resource allocation, *Water supply.
Identifiers: *Intertemporal allocation, Well yield, Ogallala formation.

This dissertation is concerned with the investigation of the intertemporal allocation of groundwater in the Central Ogallala Formation. The major objective of this study is to present estimates of (1) the growth of irrigation in the study area and (2) the rate of depletion of the aquifer over time and its effects on (a) the pattern of irrigated crop production and (b) the gross and net receipts to irrigated crop production over time. Two recursive linear programming models were employed to depict the pattern of irrigated crop production over the period 1965-2070. A multi-stage sequential decision model was developed and the dynamic programming technique was used in order to determine the optimal allocation of groundwater over a planning horizon of 100 years. Assumptions, models and input data were presented. Results of each model and comparisons of the results were discussed. It indicated that irrigators in the study area will not misallocate the groundwater resource for discount rates other than zero by Model I. But Model II showed that the population of the area should be concerned about uneconomic mining of groundwater after 1990. (Wang-Rutgers)
W71-06266

4C. Effects on Water of Man's Non-Water Activities

RECONNAISSANCE INVESTIGATION OF THE SUBSIDENCE OF VENICE AND SUGGESTED STEPS TOWARD ITS CONTROL,
Geological Survey, Sacramento, Calif.
For primary bibliographic entry see Field 02F.
W71-05870

JAMAICA BAY AND KENNEDY AIRPORT: A MULTIDISCIPLINARY ENVIRONMENTAL STUDY.
Jamaica Bay Environmental Study Group, N.Y.
For primary bibliographic entry see Field 06G.
W71-06045

WATERFRONT LAND USE IN THE AUSTRALIAN STATE CAPITALS,
Victoria Univ., (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 06B.
W71-06065

FRONTIERS IN CONSERVATION.

Available from Soil Conservation Society of America, 7515 Northeast Ankeny Rd., Ankeny, Iowa 50021-Price $5.00. Proceedings 24th Annual Meeting Soil Conservation Society of America, August 10-13, 1969, Colorado State University, Fort Collins, 1970. 162 p.

Descriptors: *Conferences, *Conservation, *Land management, *Watershed management, Methodology, Planning, Water resources, Floods, Wastes, Pollution, Agriculture, Forestry, Recreation facilities, Urbanization, Flood control, Soils, Crops, Vegetation, Water pollution sources, Economics, Abatement, Social aspects, Sediment transport.

Forty-four papers presented at the 24th annual meeting of the Soil Conservation Society of America are included in this volume. Major topics include: Soil and Land Management to Meet Conservation Goals; Water Resources Utilization and Management; Wastes in Relation to Agriculture and Forestry; Outdoor Recreational and Natural Beauty Needs and Opportunities; Urban-Suburban Conservation; and Utilization of Land to Meet Future Needs. Portions of the meeting included college-student sessions and technical-study committee sessions. (See also W71-06130 thru W71-06132) (Woodard-USGS)
W71-06129

WATER QUALITY AT THE DADE-COLLIER TRAINING AND TRANSITION AIRPORT, MIAMI INTERNATIONAL AIRPORT, AND COTTONMOUTH CAMP-EVERGLADES NATIONAL PARK, FLORIDA, NOVEMBER, 1969,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 05A.
W71-06158

SELECTED URBAN STORM WATER RUNO ABSTRACTS.
Franklin Inst. Research Labs., Philadelphia, Pa.

Copy available from GPO Sup Doc as I67, 1 11024 EJC 07/70, $2.75; microfiche from NTI PB-198 228, $0.95. EPA-WQO Report No 11 EJC, Jul 1970. 375 p. FWQA Contract No 14 704. FWQA Program 11024EJC.

Descriptors: *Storm runoff, *Urbanizat Drainage systems, Overflow, Rainfall-runoff r tionships, Sewers, Sewage treatment, Water po tion control.
Identifiers: *Combined sewers, *Storm sewers.

A compilation of abstracts summarizing artic from a variety of technical publications const ing the problem of urban drainage was develo by the Franklin Institute Research Laborato The present work includes 599 abstracts of do ments published for the most part from July 1 through June 1970. The abstracts are classed in sub-topic categories and arranged alphabetically author and numerically by abstract number wi each category. Each item includes a bibliogra citation, an abstract, and a set of indexing desc tors and identifiers. A cumulative subject inde the end of the volume provides the necessary cess to individual concepts. An author index journal list are also included. (See also W 10085, W71-06254 and W71-06255) (Ort Franklin Institute)
W71-06253

SELECTED URBAN STORM WATER RUNO ABSTRACTS (FIRST QUARTERLY ISSUE).
Franklin Inst. Research Labs., Philadelphia, Pa.

Copy available from GPO Sup Doc as 167.1 11024 EJC 10/70, $0.50; microfiche from NTI PB-198 229, $0.95. EPA-WQO Report No. 11 EJC Oct 1970. 37 p. EPA-WQO Contract 14-904.

Descriptors: *Storm runoff, *Drainage, *Sew Water pollution control, *Overflow, Pollu abatement, Sewerage, Urbanization, Treatm facilities.
Identifiers: *Combined sewers, *Storm sewers.

The first quarterly supplement to SELECT URBAN STORM WATER RUNOFF STRACTS is a compilation of abstracts summa ing articles from a variety of technical literat concerning the problem of urban drain published from July 1970 through Septem 1970. The 36 abstracts covering a range of c sections are arranged alphabetically by author numerically by abstract number within e category. Each item includes a bibliographic tion, an abstract, and a set of indexing descrip and identifiers. A cumulative subject index at end of the volume provides the necessary acces individual concepts. An author index and jou list are also included. This work was submitte fulfillment of Contract 14-12-904 between Federal Water Quality Administration and Franklin Institute Research Laboratories. (See W69-10085, W71-06253 and W71-062 (Ortner-Franklin Institute)
W71-06254

SELECTED URBAN STORM WATER RUNO ABSTRACTS (SECOND QUARTERLY ISSUE
Franklin Institute Research Labs., Philadelphia,

Copy available from GPO Sup Doc as EP2 11024 EJC 01/71, EPA/WQO Contract No 14 904, $0.60; microfiche from NTIS as PB-198 3 $0.95. EPA-WQO Report No 11024 EJC 1970. 45 p.

escriptors: *Overflow, Pollution abatement, Sewerage, *Sewers, *Storm runoff, *Urbanization, *Water pollution sources, Treatment facilities, Water pollution control.
dentifiers: *Combined sewers, *Storm sewers.

he second quarterly supplement to SELECTED RBAN STORM WATER RUNOFF ABTRACTS is a compilation of abstracts summarizng articles from a variety of technical literature oncerning the problem of urban drainage ublished from October 1970 through December 970. The 50 abstracts covering a range of ten secons are arranged alphabetically by author and nuerically by abstract number within each category. ach item includes a bibliographic citation, an abtract, and a set of indexing descriptors and dentifiers. A cumulative subject index at the end of he volume provides the necessary access to inividual concepts. An author index and a journal st are also included. (See also W69-10085, W71-6253 and W71-06254) (Ortner-Franklin Intitute)
W71-06255

IMULATION OF RUNOFF FROM URBAN WATERSHEDS,
Utah Water Research Lab., Logan.
V. V. Dhruva Narayana, J. Paul Riley, and Eugene K. Israelsen.
Water Resources Bulletin, Vol 7, No 1, p 54-68, February 1971. 6 fig, 5 tab, 5 ref.

Descriptors: *Urbanization, *Runoff, *Simulation nalysis, *Analytic techniques, Mathematical nodels, Hydrograph analysis.
dentifiers: *Urban watersheds, *Urban hydrology, Multiple regression analysis, Urban hydrologic nodels.

A mathematical model for urban watersheds is eing developed in stages at the Utah Water Research Laboratory, Utah State University at ogan. In verifying the watershed as a unit, vatershed coefficients are determined on the comuter, and related to the urbanization characeristics. The second stage of verification consists f dividing the watershed into subzones, and determining the urban parameters within each subzone. ach subzone is then individually modeled, and utflow hydrographs are routed through succeeding downstream subzones to the gaging point. The nodel thus makes it possible to: (a) develop runoff nodels for subzone hydrographs within the urban vatershed, and (b) account for spatial variations of torm and watershed characteristics. An attempt vas also made to analytically model the outflow ydrograph based on storm and watershed characeristics. (Davis-Chicago)
W71-06306

4D. Watershed Protection

LANTING CORN IN NATIVE SOD,
Nebraska Univ., Lincoln. Agricultural Experiment tation.
or primary bibliographic entry see Field 03F.
V71-06060

HE SAN SIMON WATERSHED: REVEGETATION,
rizona Univ., Tucson. Dept. of Watershed Management; and Arizona Agricultural Experiment Station, Tucson.
ilbert L. Jordan, and Michael L. Maynard.
rogressive Agriculture in Arizona, Vol 22, No 6, ov-Dec 1970, p 4-7. 1 tab, 3 fig, 2 ref.

escriptors: *Revegetation, *Brush control, Range grasses, *Soil-plant-water relationships, Water-shed management, Arizona, Reclamation, oil erosion, Creosote, Mesquite, Soil moisture, rasslands, Rainfall, Cultivation, Crop production, oil texture, Distribution, Land management, eeds, Research and development, Mechanical ntrol.
Identifiers: *San Simon watershed (Arizona), *Lehmann lovegrass, Semi-arid lands, Chaining, Pitting.

Reclamation of the eroded and frail San Simon watershed (Southeastern Arizona) is based on revegetation. Mechanical shrub control of creosotebush and sand-dune mesquite increases available soil moisture to native range grasses. Grass-reseeding and shrub-control studies were conducted to evaluate an optimum response balance under hot semi-arid conditions. There was no emergence of Lehmann lovegrass until summer rainstorms, regardless of planting time or spring rains. Lovegrass is required tillage to yield, though chaining and pitting showed promise. Soil moisture and texture are discussed for grass yields. Precipitation distribution in time and amount is the key to effective land management. Of the 9.5 inches of annual rainfall, 58% (5.5 inches) occur randomly during the summer growing season. Plowed seedbeds of Lehmann lovegrass produce the most dependable yield. Research is continuing on effective plowing methods, seedbed manipulation through different pits, fungicide treatment of seeds, seed germination, selection and development of adopted grasses, and other factors useful in managing semiarid wildland. (Popkin-Arizona)
W71-06223

PINYON-JUNIPER CONTROL: WHERE. WHY,
Arizona Univ., Tucson. Dept. of Watershed Management; and Arizona Univ., Tucson. Dept. of Range Management.
J. T. O'Rourke, and P. R. Ogden.
Progressive Agriculture in Arizona, Vol 22, No 6, Nov-Dec 1970, p 12-15. 1 tab, 3 fig.

Descriptors: *Juniper trees, *Pinyon pine trees, *Revegetation, *Erosion control, *Brush control, Watershed management, Soil textures, Phosphates, Neutralization, Calcium carbonate, Crop production, Marketing, Forages, Soil, Precipitation, Vegetation, Grazing, New Mexico, Arizona, Nevada, California.
Identifiers: *Wood products.

A discontinuous belt of pinyon-juniper (P-J) is found through New Mexico, Arizona, Nevada and California. Grazing in this belt is delicately balanced with P-J so that P-J control must be successfully conducted to minimize erosion. The object of this study is to measure precipitation, soil and vegetation characteristics to determine the influence of each on production and density of forages planted after P-J control. Four study sites in northern Arizona were selected. P-J control is recommended where there is a market for woodproducts removed, in areas of high P-J density, high precipitation, low calcium carbonate, near neutral pH, high available phosphates, and medium-textured soils. Care in extrapolation of data to other areas is recommended. Soil-water-plant relationships are basic to P-J control. (Popkin-Arizona)
W71-06225

TREATMENT OF ACID MINE DRAINAGE BY OZONE OXIDATION,
Brookhaven National Lab., Upton, N.Y.
M. Beller, C. Waide, and M. Steinberg.
Copy available from GPO Sup Doc as WQO Report 14010FMH, Dec, 1970, $1.00; microfiche from NTIS as PB-198 225, $0.95. Environmental Protection Agency-W20 Report 14010FMH, Dec 1970. 91 p, 23 fig, 28 tab, 40 ref. EPA-WQO Contract No 14-12-838.

Descriptors: *Mine Drainage, *Iron oxides, *Ozone, Industrial wastes, Neutralization, Limestones, Iron, Costs, Treatment, Waste water treatment, Oxidation.
Identifiers: Ferrous iron, Ferric iron.

An engineering design and economic study to evaluate the feasibility of ozone oxidation and limestone neutralization of Acid Mine Drainage (AMD) was performed. The study concludes that an ozone process is feasible, compares economically with existing processes, and offers potential advantages in process control, reduced neutralization costs, and simplified AMD sludge handling and disposal. Ozone production by electric discharge and radiation processes are compared both for on-site and central plant installations utilizing ozone shipping and storage facilities. A central chemonuclear ozone production plant with a distribution system is found to be most economical, followed by electric discharge central and on-site plants. Design and construction of a mobile pilot plant which employs electric discharge ozonizers is recommended for field trials of the process.
W71-06250

PROBLEM OF FLOOD-CONTROL IN SMALL BASINS,
For primary bibliographic entry see Field 07C.
W71-06298

ALL YOU SEE IS THE STREAM,
H. S. Hulme, Jr.
Am City, Vol 85, No 3, p 77-78, Mar 1970.

Descriptors: *Drainage systems, *Stream improvement.
Identifiers: Swales, Storm sewers, Arlington County, Virginia.

A controlled stream was constructed above a reinforced-concrete storm sewer enclosing Pimmet Run in Arlington County, Va. to prevent erosion upstream while retaining the aesthetic value of the stream downstream. Swales created along the stream carry local drainage and overflow from storms into the main culvert. Methods of construction and problems encountered are explained. Dimensions and costs of the system are included.
W71-06380

STRUCTURES PREVENT URBAN SEDIMENT DAMAGE,
Stephen M. Boysen.
Public Works, Vol 100, No 8, p 116-117, Aug 1969. 3 fig.

Descriptors: *Design, *Construction, *Settling basins, *Storm runoff, Performance, Operations research, Sediment control.

District of Columbia area engineers and the USCA Soil Conservation Service jointly worked to improve sediment basin design. These basins prevent damages originating from soils disturbed by intensive construction. Their purpose is to trap eroding soil and keep it on or near its original site while earth-movers do grading for new developments. These structures are temporary, but they protect stream-channels, impoundments, roads, etc. from damaging sediment. A typical sediment basin holds ponded runoff from which soil particles settle as water passes slowly into a vertical drain shortly after a heavy rain. Details regarding construction and performance are discussed. The fundamental design problem of striking a balance between detention time and economical basin size is also explored. Effectiveness of these basins is proven by the increasing number of counties employing the structures in the metropolitan Washington and Baltimore areas.
W71-06425

POLLUTION BY SEDIMENT: SOURCES AND THE DETACHMENT AND TRANSPORT PROCESSES,
Iowa State Univ., Ames. Dept. of Agricultural Engineering; and Agricultural Research Service, Beltsville, Md. Water Conservation Research Div.
For primary bibliographic entry see Field 05B.
W71-06430

CHEMISTRY OF SEDIMENT IN WATER,
Agricultural Research Service, Morris, Minn. Soil and Water Conservation Research Div; and Minnesota Agricultural Experiment Station, St. Paul.

For primary bibliographic entry see Field 05B.
W71-06431

LAND AND WATER MANAGEMENT FOR MINIMIZING SEDIMENT,
Iowa State Univ. Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 05G.
W71-06432

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

POLLUTION FROM MINES IN THE 'NEW LEAD BELT' OF SOUTH EASTERN MISSOURI,
Missouri Univ., Rolla. Dept. of Environmental Health; and Missouri Univ., Rolla. Dept. of Geochemistry.
Bobby G. Wixson, Ernst A. Bolter, Nicholas H. Tibbs, and Anthony R. Handler.
Available from NTIS as PB-198 042, $3.00 in paper copy, $0.95 in microfiche. Paper presented at the 24th Annual Purdue Industrial Waste Conference, May 7, 1969. 25 p, 9 fig, 1 tab, 16 ref. OWRR Projects A-021-MO (2) and B-021-MO (3).

Descriptors: *Water pollution sources, *Mine wastes, *Heavy metals, *Mining, *Missouri, Copper, Surface waters, Streams, Water quality, Methodology, Chemical analysis, Mine water, Ecology, Fish, Pollutant identification.
Identifiers: *Lead mining (Mo), Zinc.

In the southeastern part of Missouri, the Clark National Forest straddles the Ozark Plateau and contains the headwaters of some of the most scenic rivers in the state. In 1955, rich mineral deposits were discovered in this area and by 1962 a rich lead-zinc ore belt was found to extend for approximately thirty-six miles almost due south from Viburnum, Missouri, through Iron and Reynolds Counties. The name given this new ore district was the Viburnum Trend or the 'New Lead Belt'. This study for this report is concerned with the change of water quality and ecology of streams receiving the mining wastes. Heavy metal studies indicated that the range of values for copper, lead and zinc were from 1-20 ppb (parts per billion). The most frequently occurring values for all 3 elements were from 4-6 ppb. No significant changes in water quality were found for dissolved oxygen, alkalinity, hardness or stream temperature. Recommendations are presented for future stream pollution abatement in the 'New Lead Belt'. (See also W71-04182) (Woodard-USGS)
W71-05837

RADIOCHEMICAL ANALYSES OF WATER FROM SELECTED STREAMS, WELLS, SPRINGS, AND PRECIPITATION COLLECTED PRIOR TO REENTRY DRILLING, PROJECT RULISON,
Geological Survey, Denver, Colo.
Paul T. Voegeli, Sr., and Hans C. Claassen.
Prepared for Nevada Operations Office, US Atomic Energy Comm. Geological Survey Open-file Report USGS-474-83 (Rulison-6), 1971. 16 p, 1 fig, 4 tab, 2 ref. USAEC Agreement No AT (29-2)-474.

Descriptors: *Radiochemical analysis, *Surface waters, *Groundwater, *Colorado, *Data collections, Radioactivity, Tritium, Uranium radioisotopes, Solubility, Sampling, Methodology, Chemical analysis, Investigations, Laboratory tests, Test procedures, Water analysis, Streams, Lakes, Hydrologic data, Equations.
Identifiers: Gross alpha radioactivity, Gross beta radioactivity.

The U.S. Geological Survey established a water-sampling network in central and western Colorado on behalf of the U.S. Atomic Energy Commission to sample the hydrologic environment prior to and during the reentry drilling and the gas-production test phase of Project Rulison, an experiment to stimulate gas production from a low yield reservoir by a nuclear explosion. Samples obtained from selected streams, wells, springs, and from precipitation are analyzed for tritium, gross alpha, and gross beta activity. The analyses are made in laboratories of the U.S. Geological Survey, Denver, Colorado. This report contains data from analyses of samples from the network collected prior to reentry drilling (started April 28, 1970), including sample data obtained both prior to and after the nuclear detonation. The data are intended to give representative values over approximately a 1-year period and to show variations in natural radioactivity. (Woodard-USGS)
W71-05842

INVESTIGATIONS OF DAILY VARIATIONS IN CHEMICAL BACTERIOLOGICAL AND BIOLOGICAL PARAMETERS AT TWO LAKE ONTARIO LOCATIONS NEAR TORONTO, PART I--CHEMISTRY,
Ontario Water Resources Commission, Rexdale.
T. G. Brydges.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 750-759, 1969. 10 p, 4 fig, 1 tab, 5 ref.

Descriptors: *Lake Ontario, *Water quality, *Monitoring, Bacteria, Water chemistry, Phosphorus, Nitrogen, Ammonia, Algae, Nutrients, Sewage, Waste water (Pollution), Water pollution sources, Municipal wastes, Great Lakes, *Pollutant identification.
Identifiers: *Toronto (Ontario).

An investigation of daily variations in chemical, bacteriological and algal parameters was carried out using samples collected five days a week from Toronto Harbour and from the intake of the R. C. Harris Filtration Plant. The intake extends 2500 m from shore and is 12 m deep in 23 m of water. The study began in July 1968. Weekly depth and sediment samples were collected to supplement the daily data. Fourteen chemical parameters were monitored. Total phosphorus concentration was the best indicator of the presence of urban drainage. Ammonia and organic nitrogen concentrations in the harbor vary inversely; consequently Kjeldahl nitrogen is a better measure of water quality than either of them. Surface nitrate concentrations vary with wind speed and biological activity and do not always reflect the effects of runoff. Chlorophyll and soluble phosphorus concentrations in the harbor vary inversely. Phosphorus was apparently not limiting algal growth, but there were insufficient data to test the relationship for the open lake. Daily data were required to define some inter-parameter relationships which were not defined by data collected at weekly intervals. (See also W71-05561) (Knapp-USGS)
W71-05879

TRACE ELEMENTS IN LAKE ERIE,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
V. K. Chawla, and Y. K. Chau.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 760-765, 1969. 6 p, 4 fig, 2 tab, 10 ref.

Descriptors: *Water chemistry, *Trace elements, *Lake Erie, Distribution patterns, Copper, Iron, Sampling, Data collections, Great Lakes. Lakes, Variability, Water quality, *Pollutant identification.
Identifiers: Lead, Zinc, Lithium, Nickel.

The data on trace elements obtained from cruises during the period June to October 196 Lake Erie were examined to study their concen tions and distributions both horizontally and v cally. Of the 11 elements studied, the concen tions of cadmium, chromium and cobalt below the detection limits. The annual ave values of iron, manganese, strontium and copp surface waters were comparatively higher than average of some fresh water lakes of North A ica. Concentrations of zinc, nickel, lithium and were quite comparable. The horizontal distri tions of copper, zinc, nickel, lithium and lead uniform in the main water body of the west central and eastern basins. Iron and manga were higher in the western and central than eastern basins, however, strontium on the cont was lower in the western basin. (See also W 05561) (Knapp-USGS)
W71-05880

SOME VARIATION IN THE QUALITY WATER FROM THE SOURCE AND MOUTH THE NIAGARA RIVER,
State Univ. of New York, Buffalo. Dept. of Biol
Thomas H. Sibley, and K. M. Stewart.
In: Proceedings Twelfth Conference on G Lakes Research, May 5-7, 1969, Universit Michigan, Ann Arbor: International Associa for Great Lakes Research, p 774-785, 1969. 12 fig, 1 tab, 30 ref.

Descriptors: *Lake Ontario, *Lake Erie, *W quality, *Water pollution sources, Hard (Water), Potassium, Sodium, Chlorides, Disso oxygen, Hydrogen ion concentration, Alkali Water temperature, Great Lakes, Magnesi Streamflow, Solutes, Path of pollutants, Water lution effects.
Identifiers: *Niagara River.

An investigation in 1967 and early 1968 comp similarities and differences in selected variable water quality from the source and mouth of Niagara River. The source of the River is the l volume discharge from Lake Erie and the mou the point at which this discharge empties into L Ontario. Industrial and municipal wastes and s runoff from agricultural areas are discharged the river along portions of Western New Y (USA) and Ontario (Canada). Comparisons w made of temperature, dissolved, oxygen, pH, h ness, alkalinity, calcium, magnesium, sodi potassium, chlorides, total residue, fixed solids conductivity. Chlorides and conductivity were tinuously higher at the mouth. The mean value all parameters, except total residue and f solids, were slightly higher at the mouth. Altho the increases were relatively slight, the discha from Lake Erie is so great that even slight chan in water quality between the source and m represent impressive inputs into the river. (See W71-05561) (Knapp-USGS)
W71-05881

DISSOLVED MINERAL QUALITY OF GRE LAKES WATERS,
Department of Energy, Mines and Resour Burlington (Ontario). Canada Center for Inl Waters.
R. R. Weiler, and V. K. Chawla.
In: Proceedings Twelfth Conference on G Lakes Research, May 5-7, 1969, University Michigan, Ann Arbor: International Associa for Great Lakes Research, p 801-818, 1969. 18 fig, 5 tab, 15 ref.

Descriptors: *Water quality, *Water chemis *Water pollution sources, *Great Lakes, Trace ments, Solutes, Chlorides, Calcium, Magnesi Sodium, Potassium, Sulfates, Bicarbona Fluorine, Sampling, Industrial wastes, Lake Sup or, Lake Huron, Lake Erie, Lake Ontario, Moni ing, Data collections, Path of pollutants.
Identifiers: *Water quality monitoring.

In 1968 the Canada Center for Inland Waters (C-CIW) undertook a systematic monitoring of Lakes Ontario, Erie, Huron and Superior in a study of the major (Ca, Mg, Na, K, SO4, Cl, HCO3 and F) and trace (Zn, Cu, Pb, Fe, Ni, Cr, Mn and Sr) elements. The data gathered on major elements during the period July to November 1968 were examined and the results compared on a lake-wide basis with earlier compilations to appraise recent trends and changes in the composition of these waters. Because the concentrations of all major ions for which data are available in Lake Superior have not changed for the last 70-80 years, their levels are apparently controlled by the balance between the amount of dissolved substances added by runoff from the drainage basin and that lost through St. Mary's River. Chloride and sulphate have increased in Lakes Michigan and Huron. This increase is most likely caused by human activities. In Lakes Erie and Ontario, all the major ions except bicarbonate and magnesium have shown a dramatic increase since 1910. Previous to that, the Lakes were essentially unaffected by human activities. The median values of minor elements (excepting Sr) is generally below 10 micrograms/liter in the Great Lakes. Sorption by oxides of manganese and iron and by suspended organic and inorganic material seems a plausible mechanism for the removal of minor elements from the lakes. (See also W71-05561) (Knapp-USGS)
W71-05883

PLANKTON REDUCTION IN THE REVERSED FLOW WATERWAYS OF THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 05B.
W71-05924

CHEMICAL CHARACTERIZATION OF BOTTOM SEDIMENTS,
Environmental Protection Agency, Cincinnati, Ohio. Water Quality Office.
D. G. Ballinger, and G. D. McKee.
Journal Water Pollution Control Federation, Vol 43, No 2, 216-227, Feb 1971. 6 figs, 4 tab, 16 ref.

Descriptors: *Bottom sediments, *Chemical analysis, Organic carbon, Organic nitrogen, Water pollution, *Sediments, Pollutant identification.
Identifiers: Red River, Kanawha R., Mississippi R, Raritan Bay, Cooper River, Lake Sebasticock, Waterville Reservoir.

Laboratory examination of more than 200 sediments, using dichromate oxidation for organic carbon and Kjeldahl determination for organic nitrogen, resulted in the development of an Organic Sediment Index. Correlation of the OSI with waste loading and flow characteristics was demonstrated for two eutrophic lakes, three rivers, and two estuaries.
W71-05981

INVESTIGATIONS OF THE TECHNIQUES OF PURIFICATION OF ALGAL CULTURES: ELABORATION OF METHODS APPLICABLE TO DESMIDS, FILAMENTOUS CYANOPHYTES, AND DIATOMS, (IN FRENCH),
Centre National de la Recherche Scientifique, Gif-sur-Yvette (France). Centre de Recherches Hydrobiologiques.
For primary bibliographic entry see Field 07B.
W71-06002

EVALUATION OF AN AUTOMATIC CHEMICAL ANALYSIS MONITOR FOR WATER QUALITY PARAMETERS,
New York State Dept. of Health, Albany. Div. of Labs and Research.
James E. O'Brien, and Rolf A. Olsen.
Journal Water Pollution Control Federation, Vol 42, No 3, Part 1, p 380-390, 1970. 7 fig, 3 tab, 4 ref.

Descriptors: *Monitoring, *Water quality, *Chemical analysis, Data collections, Control systems, Measurement, Colorometry, Automatic control, Data processing, New York.
Identifiers: *CSM-12, Hudson River (NY).

The effectiveness was evaluated of a monitor to collect samples from a continuously pumped stream representative of surface water and analyze them automatically on a continuous or intermittent basis for 12 specific parameters of water quality; and to evaluate the equipment when used in conjunction with an electronic data processing system and computer. After over a year's usage it was concluded the particular equipment was not satisfactory for the designed purpose for the following reasons: No provision is made within the analytical system to compensate for interference of color and suspended matter in determining certain parameters. No satisfactory method was provided to prevent or compensate for baseline drift and, in the absence of computer control, there could be no external compensation. Mechanical and electrical solenoid valve failure prevented acceptable results for five months; their replacements also failed. No practical method was provided to prevent algae and slime growths. Friction-fitting connectors frequently failed; leakage required cleaning operations. Without extensive instrument modification correcting these deficiencies, it would be futile to evaluate the equipment in conjunction with an electronic data processing system and computer. (Jones-Wisconsin)
W71-06005

HEAVY METAL POLLUTION: POLICY AND PROGRAM IMPLICATIONS FOR THE PROTECTION OF THE ECOSYSTEM,
Department of Fisheries and Forestry, Ottawa (Ontario).
K. C. Lucas.
Presented at Special Symposium on 'Mercury and Man's Environment', February 15 and 16, 1971, Royal Society of Canada, Ottawa. Typescript, 12 p.

Descriptors: *Heavy metals, *Toxicity, *Public health, Environmental engineering, Water pollution, Fish, Mining, Industrial wastes, Iron.
Identifiers: *Mercury, Mercury pollution, Acceptable daily intake, Metal effects.

Three levels of toxicity of heavy metals can be distinguished. The heavy metals discharged into the environment are persistent, essentially indestructible elements. Some of the trace metals are necessary nutrients for the well being of organisms. Others are toxic. Little synergism has been found between heavy metals at the low concentrations. Means of controlling heavy metals pollution are discussed from the point of view of governmental agencies. The control program of Canada is outlined. The major program implications of the problem of control of heavy metal pollution are in the areas of regulation, monitoring and research. (Novotny-Vanderbilt)
W71-06078

ACTIVITIES OF THE FOOD AND AGRICULTURE ORGANIZATION AND THE WORLD HEALTH ORGANIZATION REGARDING MERCURY,
Department of National Health and Welfare, Ottawa (Ontario).
D. G. Chapman.
Presented at Symposium on 'Mercury and Man's Environment', February 15 and 16, 1971, Royal Society of Canada, Ottawa. Typescript, 7 p.

Descriptors: *Heavy metals, *Toxicity, *Human pathology, Metals, Inorganic compounds, Organic compounds, Environmental engineering, Fish, Food chains, Foods.
Identifiers: *Mercury, Acceptable daily intake, Mercury pollution, Organic mercury.

The effort of the international organizations, the Food and Agriculture Organization, and the World Health Organization, to define and establish an acceptable daily intake for mercury and a tolerance for mercury on food products is discussed in the paper. It was suggested that the background levels (practical residue limits) of mercury in foods amount to 0.02 to 0.05 ppm. Officially the two agencies of the United Nations have not found it possible to establish an acceptable daily intake for mercury and hence have not recommended tolerances for mercury in food. (Novotny-Vanderbilt)
W71-06079

AN INTERFEROMETRIC TECHNIQUE FOR TEMPERATURE AND CONCENTRATION MEASUREMENT FOR AN AIR-WATER INTERFACE,
Virginia Univ., Charlottesville.
C. Prasad, C. S. Chen, and J. T. Beard.
Journal of Basic Engineering, Transaction ASME, Paper No 70-WA, Temp-1, 1970. 6 p.

Descriptors: *Heat transfer, *Mass transfer, *Measurement, *Instrumentation, Temperature, Temperature control, Air-water interfaces, Boundary processes, Evaporation, Convection, Diffusion.
Identifiers: Temperature measurement, Mass transfer measurement.

A new technique for the measurement of temperature and concentration for a simultaneous heat and mass transfer analysis is described. The technique employs a one wavelength Mach-Zehnder interferometer with an additional noninterferometric measurement of temperature or concentration. This overcomes the difficulties encountered in other interferometric techniques used for simultaneous heat and mass transfer analysis such as two wavelength technique and one wavelength technique with the assumption of Lewis number being unity. Computational formulas were developed by which either temperature or concentration can be calculated from the interferograms. An air-vapor boundary layer formed due to heated water and ambient air sent in parallel flow was analyzed with this technique. Better results in the air-water system were obtained for the concentration from interferogram analysis with the temperature measured by another technique. (Novotny-Vanderbilt)
W71-06090

THERMAL CRITERIA - A MEASURE TO CONTROL THERMAL POLLUTION,
New York State Dept. of Health, Albany.
For primary bibliographic entry see Field 05C.
W71-06096

THE FACTS BEHIND THE MERCURY,
James T. Parker.
Popular Science, p 62-63, December 1970.

Descriptors: *Heavy metals, *Water pollution, *Path of pollutants, Toxicity, Public health, Fish, Environmental engineering, Water pollution effects, Bottom sediments, Aquatic microorganisms, Pollutant identification, Chemical wastes.
Identifiers: Metals effects, Mercury, Mercury pollution, Organic mercury.

In 1969, Canadian authorities discovered mercury levels of 10 ppm in fish from Lake St. Clair and the Lake Erie region. The maximum level in food deemed safe for human consumption is 0.5 ppm and in water 0.5 ppb. The mercury present is in form of methyl-mercury which is 100 times more toxic than metalic mercury. The mechanism of transferring metalic mercury into its organic form is a complex process accomplished by the action of microorganisms in bottom sediments and rotten fish. The length of active life of mercury-contaminated sediments in lakes and rivers is not known. About 78,000 flasks of mercury of 76 pounds each were consumed in the United States in 1969 with 26% used by factories making chlorine

and caustic soda. The technique of detecting mercury is discussed. (Novotny-Vanderbilt)
W71-06100

DEVELOPMENT OF AN INSTRUMENT FOR MEASURING THE CONCENTRATION OF DISSOLVED OXYGEN IN SEA WATER IN SITU,
Hawaii Inst. of Geophysics, Honolulu.
Volker Grafe.
Available from NTIS as PB-196 145, $3.00 in paper copy, $0.95 in microfiche. Report HIG-70-29, November 1970. 20 p, 9 fig, 6 ref. WSF Grant No GA-779.
Identifiers: *Sea water, Oxygen, *Dissolved gases, Measurement, Accuracy, Ocean bottom, Telemetering equipment, Digital systems, Oxygen sensors.

An instrument is described consisting of a commercially available oxygen sensor and of a newly developed telemetering and digitizing system which permits measurement of the concentration of dissolved oxygen even in great oceanic depths. The instrument employs a frequency modulation telemetry scheme and is compatible in its frequency range and its power requirements with the Bisset-Berman TDS-recorder. The accuracy of the instrument is determined by the accuracy of the oxygen sensor.
W71-06104

WATER QUALITY OF THE DELAWARE RIVER ESTUARY, JULY THROUGH DECEMBER 1967,
Geological Survey, Washington, D.C.

Geological Survey open-file report 1970. 84 p, 1 fig, 2 tab, 4 ref.

Descriptors: *Water quality, *Delaware River, *Estuaries, *Hydrologic data, *Data collections, Chemical analysis, Tides, Tidal waters, Sampling, Boats, Chemical properties, Salinity, Dissolved solids, Dissolved oxygen, Water chemistry, Biological properties.
Identifiers: Analytical data (Tables).

Samples collected from the Delaware river were taken three feet below the water surface at the center of the navigation channel by boat at 17 selected stations extending from Reedy Island, Del., to Fieldsboro, N. J., about 6 miles below the head of tide at Trenton, N. J. Sampling runs were made at approximately weekly intervals. For each run, the boat began at the farthest downstream station and proceeded upstream. Samples were collected at each station at slack tide. About two-thirds of the runs were made at low-water slack and the remainder at high-water slack. Samples were analyzed for over 30 water-quality parameters. Tables present the analytical data obtained during the first 6 months of the program, covering the last half of 1967. The data were retrieved and printed out by computer. Four tables are presented for each station--two tables of analytical results and two of statistical summaries. Maximum observed chloride concentrations ranged from 15 to 20 mg/liter above river mile 110, increasing to 50 mg/liter between river miles 85 and 90, and to 7,500 mg/liter at river mile 55. During the summer season dissolved oxygen concentrations ranged from a maximum of 9 mg/liter to a minimum of less than 1 mg/liter. The higher values were observed in the upper and lower portions of the Estuary and the lowest values were observed in the reach between river miles 70 and 100. (Woodard-USGS)
W71-06156

A PORTABLE MULTIPARAMETER WATER QUALITY KIT,
Geological Survey, Menlo Park, Calif.
Keith V. Slack.
Journal Water Pollution Control Federation, Vol 42, No 7, p 1395-1399, July 1970. 5 p, 3 fig, 2 ref.

Descriptors: *Water quality, *On-site tests, *Water analysis, Instrumentation, Sampling, Testing, Hydrogen ion concentration, Dissolved oxygen, Electrical conductance, Water temperature.
Identifiers: *Field water-analysis kit.

A kit was assembled from commercial units for instrumental measurement of four water quality properties on grab samples or in situ in streams and shallow lakes. The water quality kit consists of an instrument package and an accessory package. The instrument package contains all equipment needed for measurements of temperature, pH, DO, and specific conductance on water samples or at near-surface depths. The accessory package contains supplies and equipment for several supplementary quality determinations and extends the capability of temperature, DO, and conductance measurements to depths of 35 m. A device is included for taking water samples from the surface to depths of at least 15 to 20 m. The compact size of the equipment is well suited to field use or to transporting as luggage on commercial carriers. The cost will vary with the particular models used, but in the present example was about $750 for the instrument package and $100 for the accessory package. (Knapp-USGS)
W71-06157

WATER QUALITY AT THE DADE-COLLIER TRAINING AND TRANSITION AIRPORT, MIAMI INTERNATIONAL AIRPORT, AND COTTONMOUTH CAMP-EVERGLADES NATIONAL PARK, FLORIDA, NOVEMBER, 1969,
Geological Survey, Tallahassee, Fla.
Benjamin F. McPherson.
Geological Survey open-file report No 70011, 1970. 29 p, 2 fig, 9 tab, 7 ref.

Descriptors: *Water pollution sources, *Airports, *Florida, *Urbanization, Pesticides, Oily water, Solutes, Nitrogen, Phosphorus, Organic matter, Heavy metals, Path of pollutants, Water pollution effects.
Identifiers: *Everglades, *Miami (Fla).

Water quality was determined at three areas in south Florida in November 1969 to compare conditions at a commercial jetport (Miami International Airport), and in a natural environment (Cottonmouth Camp in Everglades National Park) and a transitional environment (Dade-Collier Training and Transition Airport). Water in canals near Miami International Airport generally contained more nitrogen, phosphorus, organic carbon, trace elements and heavy metals, and less dissolved oxygen than waters at the other areas. Concentrations of chromium, lead, and oil in surface water at Miami International Airport exceeded the limits established by the Federal Water Quality Administration; concentrations were below these limits in the other areas. Sediment at Miami International Airport was heavily coated with oil and grease (23%) at station 5, and contained 85.2 micrograms per kg on the DDT family at station 1. Sediment at other stations contained less than 3.0% oil and grease and less than 4.2 micrograms/kg of the DDT family. (Knapp-USGS)
W71-06158

METHODS FOR CHEMICAL ANALYSIS OF FRESH WATERS.
Hydrobiologisch Institutt, Nieuwersluis, (Netherlands); and Westfield Coll., London (England).
For primary bibliographic entry see Field 02K.
W71-06159

THE MONOCACY RIVER-PHYSICAL, CHEMICAL AND BACTERIOLOGICAL WATER QUALITY REPORT NUMBER 1, MARCH-DECEMBER 1966,
Maryland Dept. of Water Resources, Baltimore. Div. of Water Quality Investigations.
For primary bibliographic entry see Field 05B.
W71-06176

MONTHLY VARIATION IN PHOSPHATE AND RELATED CHEMICALS FOUND IN THE SEDIMENT IN THE ISLAND AREA OF LAKE ERIE 1967-68, WITH REFERENCE TO SAMPLES COLLECTED IN 1964, 1965, and 1966,
Ohio State Univ., Columbus. Water Resources Center.
For primary bibliographic entry see Field 05B.
W71-06187

MAYFLY DISTRIBUTION AS A WATER QUALITY INDEX,
Winona State Coll., Minn.
Calvin R. Fremling.
Copy available from GPO Sup Doc as No 16030 DQH, Nov 15, 1970, $0.50; microfiche from NTIS as PB-198 223, $0.95. EPA-WQO Final Report No 16030 DQH, Nov 15, 1970. 39 p, 18 fig, 54 ref. WP00987.

Descriptors: Mayflies, Water quality, Indicators, Water pollution effects, Mississippi River.
Identifiers: Hexagenia, Pentagenia.

Three species of burrowing mayflies (Hexagenia bilineata, Hexagenia limbata, and Pentagenia vittigera) are sufficiently abundant to cause nuisance problems along portions of the Mississippi River. Mayfly distribution, as determined by collections made by ship captains and other cooperators over a 13-year period, has proven to be an excellent index of general water quality on a river which is so large that is cannot be monitored effectively or economically by standard methods. Pollutants have severely reduced the numbers of all three species for 300 miles below Minneapolis, Minnesota, and for over 300 miles below St. Louis, Missouri. P. vittigera is able to emerge only in early and late summer in the St. Louis area when cool water temperatures lessen toxic effects in the zone of degradation. Impoundment and enrichment of the Upper Mississippi River has temporarily increased the carrying capacity of the river for H. bilineata which now dominates areas formerly dominated by H. limbata. The total productivity of the Upper Mississippi is being reduced by pollution, man's encroachment into the flood plain and by the filling of navigation pools by sand. Methods have been developed to rear large numbers of Hexagenia nymphs in the laboratory. Bioassay tests utilizing artificial, burrow-containing substrates reveal that H. bilineata nymphs can survive anaerobic conditions for as long as 11 hours. TLm values for hydrogen sulfide varied from 0.42 ppm at 48 hr to 0.17 ppm at 96 hr. Of several heavy metals (Cr, Ni, Zn, Cu) tested, copper was the most toxic to H. bilineata nymphs. TLm values for copper ranged from 0.54 ppm at 12 hr to 0.22 ppm at 48 hr.
W71-06248

CHARACTERIZATION OF OIL SLICKS ON SURFACE WATERS,
Federal Water Quality Administration, Cincinnati, Ohio. Analytical Quality Control Lab.
F. K. Kawahara, and D. G. Ballinger.
Industrial and Engineering Chemistry, Product Research and Development Quarterly, Vol 9, No 4, p 553-558, 1970. EPA-WQO Project 1602.

Descriptors: *Infra-red, *Radiation, *Oil wastes, *Oily water, *Asphalt, Absorption, Pollution identification.

Ratios of infrared absorption from unidentified petroleum pollutants are compared with those from industrial asphalts and residual fuel oils. Asphalts, No. 6 fuel oils, No. 5 fuel oils, and lubricating oils were characterized. Supplemental analyses - API gravity, solubility behavior, distillates - supplement the initital classification by the RIA technique. (Kawahara-EPA/WQO)
W71-06261

AN ELECTRODE CHAMBER FOR RECORDING RESPIRATORY AND OTHER MOVEMENTS OF FREE-SWIMMING ANIMALS,
National Water Quality Lab., Duluth, Minn.

W. A. Spoor, T. W. Neiheisel, and R. A. Drummond.
Trans Amer Fisheries Soc Vol 100, No 1, p 22-28, 1970. 5 fig, 19 ref. Project No 18050 WAE 01/71, Grant No WP-01317-01.

Descriptors: *Fish behavior, *Fish physiology, *Electronic equipment, Remote sensing, Water pollution effects, Aquatic invertebrates, Laboratory equipment, Laboratory animals.
Identifiers: *Electrode chamber, Electrode design.

The occurrence of potential differences in the microvolt range between stainless steel electrodes immersed in water at opposite ends of an animal chamber can be related clearly to respiratory and other movements of animals moving freely in the water. The differences are attributed to the effects of water currents on the equilibrium potentials of the electrodes. The chamber can be large or small, according to the size of the animal. Changes over the biological range in such variables as temperature, dissolved oxygen concentration, free carbon dioxide and pH do not interfere; neither do metals in dilute solution, or non-electrolytes. Inorganic salts affect electrode sensitivity, but not seriously in fresh water, and the method can be made to work in sea water.
W71-06328

CHEMISTRY OF NITROGEN IN SOILS,
Illinois Univ., Urbana. Dept. of Agronomy; and Missouri Univ., Columbia. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W71-06436

CHEMISTRY AND METABOLISM OF INSECTICIDES,
Iowa State Univ., Ames. Dept. of Zoology and Entomology.
For primary bibliographic entry see Field 05C.
W71-06438

THE PESTICIDE BURDEN IN WATER AND ITS SIGNIFICANCE,
Federal Water Pollution Control Administration, Athens, Ga. Southeast Water Lab.
For primary bibliographic entry see Field 05B.
W71-06439

5B. Sources of Pollution

POLLUTION FROM MINES IN THE 'NEW LEAD BELT' OF SOUTH EASTERN MISSOURI,
Missouri Univ., Rolla. Dept. of Environmental Health; and Missouri Univ., Rolla. Dept. of Geochemistry.
For primary bibliographic entry see Field 05A.
W71-05837

WATER CHEMISTRY OF TOXAPHENE - ROLE OF LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
Gilman D. Veith, and G. Fred Lee.
Environmental Science and Technology, Vol 5, No 3, p 230-234, March 1971. 5 p, 1 fig, 4 tab, 20 ref.

Descriptors: *Path of pollutants, *Bottom sediments, *Pesticides, *Chlorinated hydrocarbon pesticides, Mixing, Leaching, Laboratory tests, Clay minerals, Water chemistry, Biodegradation.
Identifiers: *Toxaphene.

The role of lake sediments in the detoxification of lakes which were treated with toxaphene was evaluated under environmental and laboratory conditions. The extent of toxaphene accumulation in sediments of three Wisconsin lakes was determined by electron capture gas chromatographic analysis of core sections and Ekman dredge samples. The toxaphene concentration in the 0 to 5-cm level of the sediment increased for 190 days following the treatment of the lakes and then began decreasing by a factor of 2 every 120 days. Toxaphene was transported vertically to the 5 to 10-cm and the 10 to 15-cm level of the sediment at rates varying from 0.4 to 1.1 cm per day in the three lakes. Toxaphene was not detected below the 20-cm level of the sediments. Toxaphene which was sorbed onto the sediment in the lake could not be leached from the sediment by lake water under laboratory conditions. (Knapp-USGS)
W71-05840

MERCURY USES IN CANADA AND THEIR POSSIBLE HAZARDS AS SOURCES OF MERCURY CONTAMINATION,
University of Western Ontario, London. Dept. of Zoology.
Norvald Fimreite.
Financed by contract with Canadian Wildlife Service. Environmental Pollution, Vol 1, No 2, p 119-131, October 1970. 13 p, 4 fig, 1 tab, 38 ref.

Descriptors: *Water pollution sources, *Surface waters, *Heavy metals, *Industrial wastes, Inorganic compounds, Streams, Lakes, Aquatic habitats, Fishkill, Wildlife, Birds, Ecology, Environmental effects, Soils, Plants, Industrial production, Chlorine, Seeds, Poisons, Water pollution effects.
Identifiers: *Mercury, *Mercury contamination (Canada).

During the past ten years mercury consumption has shown a strong upward trend in Canada. The major proportion of this increase can be accounted for by the chloralkali industry, from which nearly 200,000 lbs of mercury are released into the environment each year. Most of this mercury finds its way to watercourses exposing aquatic ecosystems where mercury is known to accumulate. The use of mercury compounds for slime control in the Canadian pulp industry is decreasing, but in one case elevated mercury levels in fish were traced back to such a source. Also decreasing is the use of seed-dressings containing mercury, although this use of mercurials is still considerable, and in view of findings in other countries elevated mercury levels in seed-eating birds and their predators must be expected. Elevated levels of mercury were found in pheasants and partridges collected in Southern Alberta where mercury seed-dressings are extensively used. (Woodard-USGS)
W71-05861

DIFFUSION FROM A CONTINUOUS SOURCE IN A UNIFORM SHEAR FLOW,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
Akira Okubo, and Michael J. Karweit.
Limnology and Oceanography, Vol 14, No 4, p 514-520, July 1969. 7 p, 5 fig, 16 ref. USAEC Contract AT (30-1)-3109; ONR Contract Nonr 4010 (11).

Descriptors: *Diffusion, *Dispersion, *Mixing, *Path of pollutants, Flow, Diffusivity, Non-uniform flow, Turbulant flow, Shear, Mathematical models.
Identifiers: *Shear flow.

The importance of velocity shear in the diffusion of a patch of passive contaminant from an instantaneous source is well recognized. Shear also plays an important role in the spread of contaminant from a continuous source. A model for the diffusion of a dynamically passive contaminant from a continous source is presented. This source is superposed on a mean flow with uniform shear. An equation is derived which shows by numerical solution that the maximum concentration of the contaminant in the resulting plume decreases nearly as the reciprocal of the distance. Small and large time approximations verify this result analytically. The skewness of the concentration distribution at various distances from the source is also analyzed. This diffusion model compares favorably with diffusion experiments conducted in seas and lakes. (Knapp-USGS)
W71-05872

REMOVAL OF CONTAMINANTS FROM LAKE ONTARIO BY NATURAL PROCESSES,
Canadian Oceanographic Data Centre, Ottawa (Ontario).
For primary bibliographic entry see Field 05G.
W71-05878

INVESTIGATIONS OF DAILY VARIATIONS IN CHEMICAL BACTERIOLOGICAL AND BIOLOGICAL PARAMETERS AT TWO LAKE ONTARIO LOCATIONS NEAR TORONTO, PART I--CHEMISTRY,
Ontario Water Resources Commission, Rexdale.
For primary bibliographic entry see Field 05A.
W71-05879

SOME VARIATION IN THE QUALITY OF WATER FROM THE SOURCE AND MOUTH OF THE NIAGARA RIVER,
State Univ. of New York, Buffalo. Dept. of Biology.
For primary bibliographic entry see Field 05A.
W71-05881

SURFACE WATER INPUTS OF IODINE, BROMINE, AND CHLORINE TO LAKE HURON,
Michigan Univ., Ann Arbor. Dept. of Meteorology and Oceanography; and Michigan Univ., Ann Arbor. Great Lakes Research Div.
Mary A. Tiffany, and John W. Winchester.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 789-800, 1969. 11 p, 3 fig, 10 tab, 12 ref, 2 append. AEC Contract AT (11-1)-1705.

Descriptors: *Water pollution sources, *Lake Huron, *Halogens, *Great Lakes, Chlorine, Chlorides, Path of pollutants, Water balance, Salinity, Industrial wastes.
Identifiers: Bromine, Iodine, Saginaw River.

Surface waters were systematically sampled and analyzed for chlorine, bromine, and iodine by neutron activation for material balance calculation of inputs and outflows for Lake Huron. Saginaw River basin samples (42) from autumn 1968 showed marked halogen pollution, also detected in 11 Saginaw Bay samples. River water from 16 northern Michigan and Ontario locations was less polluted. Using these and previously published analyses, together with available rainfall and river discharge data, total input/outflow ratios for Lake Huron are: Cl, 1.04; Br, 1.73; I, 1.15. Cl and I are apparently near a steady state, but inflow of Br significantly exceeds outflow. If present inputs continue, the Br concentration will rise in Lake Huron, but Cl and I will remain roughly constant. Reducing Saginaw River halogen pollution, which supplies nearly half the Cl and Br input, should decrease Lake Huron Cl concentration and arrest the increase of Br concentration. (See also W71-05561) (Knapp-USGS)
W71-05882

DISSOLVED MINERAL QUALITY OF GREAT LAKES WATERS,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
For primary bibliographic entry see Field 05A.
W71-05883

PLANKTON REDUCTION IN THE REVERSED FLOW WATERWAYS OF THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO,
Metropolitan Sanitary District of Greater Chicago, Ill.
Norman W. Youngsteadt.
Metropolitan Sanitary District of Greater Chicago, April 25, 1969. 32 p, 14 fig, 4 tab, 5 ref.

Descriptors: *Plankton, *Phytoplankton, *Water pollution, *Monitoring, *Water quality control, Sewage effluents, Waste water, Water analysis, Sampling, Illinois.
Identifiers: *Chicago.

A preliminary survey of the plankton of the reversed-flow waterways of the District, made in 1967, revealed a reduction in plankton concentration upon traveling downstream from the Lake Michigan inlets. At that time, it was thought the decrease in expected plankton concentrations could have resulted from death due to pollution, and the phenomenon of decreasing concentrations of plankton might thus be used to establish an index to the relative degree of pollution in the reversed flow waterways. A system of sampling was established and plankton was collected from the District's reversed flow waterways on October 14 and 15, 1968. Plankton were found to be reduced in concentration between Lake Michigan inlets and downstream portions to a greater extent than could be accounted for due to additions of non-plankton bearing water. Reduction patterns corresponded closely to those noted for samples collected in October of the previous year. It was concluded that these reductions were likely due to poor water quality conditions and that if water quality improved, future sampling would reveal a lesser degree of plankton reduction. The effectiveness of plankton reduction as a monitor of water quality will become known when pollution control measures are taken and pollution is reduced. If plankton reduction is simultaneously reduced, the method will be proved and development into a reliable tool for estimating relative water quality will be at hand. (Poertner)
W71-05924

GENESEE COUNTY ENVIRONMENTAL HEALTH, CONCLUSIONS REPORT, GENESEE COUNTY, MICHIGAN.
Genesee County Metropolitan Planning Commission, Flint, Mich.; and Battelle Memorial Inst., Columbus, Ohio.

Copies of report are available from: Genesee County Metropolitan Planning Comm., Flint, Mich.; and HUD Regional Office Library, 306 N. Michigan Ave., Chicago, Illinois 60601. Genesee County Metropolitan Planning Commission, Flint, Michigan, February 1970. 159 p, 15 fig, 73 ref. HUD Project No Mich P-155.

Descriptors: *Water pollution, *Water pollution sources, *Urbanization, *Water quality control, *Land use, *Water pollution control, Soil erosion, Waste water treatment, Sewerage, Public health, Environmental engineering, Michigan.
Identifiers: *Genesee County, *Flint, Environmental health.

This report examines the current status of pollution in the air, soil, and water sectors of the environment of Genesee County. Current and future programs at the federal, state, and local levels, and existing facilities are evaluated in terms of adequacy in controlling and preventing pollution problems found to be present in the three sectors of the environment. In addition to recommendations and conclusions on existing and proposed legislation and programs and existing facilities, the report contains recommendations regarding the relationship of land use planning to control and prevention of environmental pollution Genesee County to 1990. It was concluded that there is considerable water pollution in the county, particularly in the Flint River and tributaries entering in the City of Flint. Control of pollution requires, above all, construction and improvement of waste collection and treatment facilities to keep waste discharges at a level not detrimental to desired uses of the water. Prime factors contributing to water pollution include poor drainage, gentle channel slopes, low oxygen reaeration in streams, and the presence of swamps. Of all water pollution alternatives, direct treatment of waste discharges is presently the only effective means available within feasible cost limits. (See also W71-05933) (Poertner)
W71-05934

DISTRIBUTION OF TRACE METALS IN IMPOUNDMENTS,
Arkansas Univ., Fayetteville Resources Research Center.
J. Nix.
Available from NTIS as PB-198 089, $3.00 in paper copy, $0.95 in microfiche. Arkansas Water Resources Research Center, Fayetteville, Publication No 6, January 1970. 194 p, 31 tab, 71 fig, 44 ref. OWRR Project B-002-ARK (2).

Descriptors: Water quality, *Trace elements, Reservoir, *Impoundments Arkansas, *Metals, Heavy metals, Iron, Copper, Cobalt, Lead, Chromium, Water pollution sources.
Identifiers: *Ouachita River (Ark), *Trace metals, Zinc, Nickel.

An investigation of the trace element content of two impoundments on the Ouachita River, Arkansas, was conducted. Common water quality parameters were followed in the reservoirs in an effort to determine the factors which were influencing the trace element concentration. The following trace metals were determined in both the particulate phase (retained by a 0.45 micron filter) and the soluble phase (passed by a 0.45 micron filter): iron, manganese, copper, cobalt, nickel, lead, chromium, and zinc. These measurements were made periodically for one and a half years. Results indicate that the chemical regime of the impoundments which were studied was greatly influenced by the cool water releases from an upstream impoundment. A cold density current throughout the entire main stem of the reservoir furnished dissolved oxygen to the lower portion of the impoundments and prevented the accumulation of large quantities of iron and manganese. More typical hypolimnic conditions were observed in the sidepockets of the reservoir. Data suggest that outside of hypolimnic zones in the reservoir, soluble iron is present in very small quantities, usually less than 10 ppb.
W71-05971

EFFECT OF FEEDLOT LAGOON WATER ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF SOILS,
Kansas State Univ., Manhattan. Dept. of Agronomy, and Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05C.
W71-05974

POLLUTION - ARE FERTILIZERS AT FAULT,
Maryland Univ., College Park. Dept. of Soils.
Fred P. Miller.
Crops and Soils Magazine, p 15-30, September 1970. 8 fig.

Descriptors: *Water pollution sources, *Fertilizers, *Agriculture, Nitrogen, Phosphorus, Nutrients, Runoff, Nitrification, Minnesota.
Identifiers: Potomac River (DC), Fort Wayne (Ind).

A comparison of non-farm contribution to water pollution indicates agriculture's share as neither alarmingly large nor, in many areas, important. Farm fertilizers do not appear to be the major contributors; most phosphates fed into the Mississippi River through sediments, are native to the soil itself and not the result of fertilization. Probably the greatest concern is the nitrogen loss from animal wastes. Most of the nutrients draining from farmlands accrue from these wastes and from spreading manure on frozen ground. Under recommended fertilization programs, the bulk of data seems to indicate that nitrogen losses through leaching are not significant on most cultivated soils and, generally, are much less than 10-20% of that applied. The present evaluation does not indicate that fertilizer usage is in serious violation of the ecological balance. Natural nitrification processes in the soil and nitrification of sewage effluent and animal wastes seem to be the major contributors to nitrate in groundwater. Many of Minnesota's eutrophied lakes are in areas completely isolated from agricultural watersheds. The case against fertilizers appears to have been overstated by many. (Jones-Wisconsin)
W71-05996

MAN-MADE SOURCES OF MERCURY,
National Swedish Environment Protection Board, Stockholm.
Arne Hanson.
Presented at Symposium on 'Mercury and Man's Environment', February 15 and 16, 1971, Royal Society of Canada, Ottawa. Typescript, 20 p.

Descriptors: *Heavy metals, *Water pollution, *Industrial wastes, Metals, Water pollution effects, Catalysts, Inorganic compounds, Pulp and Paper Industry, Public health, Environmental engineering, Chemical wastes, Agricultural chemicals, Food, Food chains.
Identifiers: Mercury pollution, Sources of mercury.

In Sweden today, the commercial harvesting of fish has been prohibited in more than sixty water areas due to the high level of mercury in fish. The sources of mercury are apparatus and instruments, manufacture of mercury compounds, the chlor-alkali industry, catalysts, dental use, recovery and purification of mercury, the paint industry, the pulp and paper industry, agricultural use, raw materials, and basic chemicals. The forms and compounds of mercury wasted from these processes are described. The following measures are recommended: prohibition of mercury use or restriction, changing or improving processing techniques, and improved water and air purification techniques. Approximately 500 tons of mercury have been deposited in the bottom sediments of Swedish waters. It is believed that the recycling of mercury from bottom sediments will be a major water pollution problem in the future. (Novotny-Vanderbilt)
W71-06077

THERMAL DISCHARGE: A MODEL - PROTOTYPE COMPARISON,
Pacific Gas and Electric Co., Emeryville, Calif. Engineering Research Dept.
R. M. Miner, P. D. Hindley, and R. F. Cayot.
ASCE National Water Resources Engineering Meeting, Phoenix, Arizona, Jan 11-16, 1971. 40 p, 20 fig, 1 tab.

Descriptors: *Thermal pollution, *Water temperature, *Model studies, *Prototypes, *Estuaries, Mixing, Instrumentation, Tides.
Identifiers: Thermal discharge, Infrared sensing.

Receiving water temperature distributions resulting from the thermal discharge of Pacific Gas and Electric Company's existing Pittsburg power plant, which is located on the San Francisco Bay tidal estuary, have been measured for several years. Both conventional and infrared temperature acquisition techniques have been used. It was desired to compare these distributions with those obtained by simulating the thermal discharge on the San Francisco Bay-Delta Model, which is operated by the Corps of Engineers. The photographs presented show that the model accurately reproduces the general features of the prototype cooling water discharge. Both qualitative and quantitative results indicate that the distorted model used in this case was capable of reproducing the relevant prototype processes with an accuracy sufficient for the study of a power plant thermal discharge problem. The differences between model and prototype results are due to certain limitations in the experimental procedures, and the inherent randomness of a turbulent mixing process. (Upadhyaya-Vanderbilt)
W71-06095

A STUDY OF THE BEHAVIOR OF OIL SPILLS IN THE ARCTIC,
Coast Guard, Washington, D.C. Applied Technology Div.
John L. Glaeser, and George P. Vance.
Available from NTIS as AD-717 142, $3.00 in paper copy, $0.95 in microfiche. Final Report, Feb 1971. 60 p, 18 fig, 3 tab, 6 ref. Project No 714108/A/001,002.
Identifiers: *Water pollution, *Oils, *Arctic regions, Water pollution, Petroleum, Combustion, Removal, Control, Ice, Aging (Materials), Adsorption, Sraw, Wind, Viscosity, *Oil pollution, Abatement, *Water pollution control.

A program to investigate the behavior of oil spills in the Arctic was conducted off the northern coast of Alaska in July 1970. Numerous small oil spills were made to obtain data on the following subjects: the spreading behavior of crude oil on ice and water surfaces; the interaction characteristics of crude oil with ice; the aging characteristics of crude oil which has been spilled on ice, on water, and under ice; and the effectiveness of burning and absorption as methods of removal. Both Prudhoe Bay ('Sag River) crude oil and diesel fuel were used in the test program. Results quantify spreading and interaction characteristics in addition to presenting qualitative information on each area of interest. Promise is shown for both burning and absorption as methods of oil removal in the summer. Data is presented on both the physical and chemical characteristics of aged crude oil.
W71-06101

SPECIAL STUDIES OF A SANITARY LANDFILL,
University of Southern California, Los Angeles.
Robert C. Merz, and Ralph Stone.
Available from NTIS as PB-196 148, $3.00 in paper copy, $0.95 in microfiche. Final Summary Report, 1970. 217 p, 15 fig, 21 tab. PHS Grant No U1-00518-08.
Identifiers: *Earth fills, *Refuse disposal, *Garbage disposal, Earth fills, *Sanitary engineering, Earth fills, Waste disposal, Aeration, Percolation, Anaerobic conditions, Aerobic processes, Gases, Compacting, Field tests, Rainfall intensity, Climate setting, *Sanitary landfills, *Solid waste disposal.

Model sanitary landfill cells were constructed and, over a 4.. year period, subjected to simulated environmental conditions such as added water, aeration, and aerobic and anaerobic operation. The effect of these conditions on percolation, gas quality and production, settlement, and temperature was measured. Examination of core samples taken at the end of the study period showed that refuse in the aerated cell was well decomposed except for plastics and other inerts and that refuse in the anaerobic cells was easily identifiable. Based on an original cell depth of 20 feet, volume reduction in the aerated cell was 21.5% and in the anaerobic cells, 11.5%. The four parts of this report detail the activity during the last year of the project and summarize the data collected for the span of the project (1/1/64 to 12/31/68).
W71-06103

COMMUNITY FACILITIES PLAN; WATER AND SEWER PLAN; PUBLIC IMPROVEMENTS PROGRAM AND CAPITAL BUDGET, DECHERD, TENNESSEE.
Dechard Municipal Planning Commission, Tenn.
For primary bibliographic entry see Field 06B.
W71-06105

SANITARY CONTROL OF SHELLFISH IN KOREA,
Environment Control Administration, Cincinnati, Ohio. Water Supply and Sea Resources Program.
For primary bibliographic entry see Field 02L.
W71-06110

PROBLEMS OF POLLUTION OF IRRIGATION WATERS IN ARID REGIONS,
Utah State Univ., Logan, Dept. of Agricultural and Irrigation Engineering; and Robert S. Kerr Water Research Center, Ada, Okla.
H. B. Peterson, A. A. Bishop, and J. P. Law, Jr.
In: Water Quality Management Problems in Arid Regions, Federal Water Quality Administration Water Pollution Control Research Series 13030 DYY 6/69, p 17-36, October 1970. 20 p, 3 fig, 4 tab, 27 ref.

Descriptors: *Irrigation water, *Water pollution sources, *Irrigation, *Arid climates, Surface waters, Groundwater, Irrigation effects, Agriculture, Agricultural chemicals, Saline water, Wastes, Evaporation, Water pollution sources, Water conservation, Sediments, Soil-water-plant relationships, Nutrients, Irrigation practices.

The climate in arid regions is conductive to high evapotranspiration losses and a minimum of natural leaching. For intensive crop production, irrigation is necessary. Irrigated soils of the United States are scattered throughout, but the major areas are in the 17 western states. Within these, the areas most adversely affected by salt in the irrigation return flow are those in the lower reaches of the larger river systems of southwestern United States; those areas in the Lower Basin of the Colorado River, the Gila and Salt Rivers of Arizona, the Rio Grande in New Mexico and Texas, the San Joaquin River in California, and similar streams. In all of these river basins, there is a progressive deterioration in water quality as it flows downstream. Different pollutants have very diverse and changing effects on the value of water. Salts generally decrease the value more or less in proportion to the concentration increase; however, there are broad critical ranges where the user is forced to change the type of crop, and then there may be a sharper value decline for a given increment of salt. This can continue until at some concentration the water can no longer be used for irrigation and must be disposed of or treated. (See also W71-06111) (Woodard-USGS)
W71-06112

NATURAL POLLUTION IN ARID LAND WATERS,
Utah State Univ., Logan. Ecology Center.
John M. Neuhold.
In: Water Quality Management Problems in Arid Regions, Federal Water Quality Administration Water Pollution Control Research Series, 13030 DYY 6/69, p 79-84, October 1970. 6 p, 2 ref.

Descriptors: *Water pollution, *Arid lands, *Surface waters, *Water pollution sources, Streams, Streamflow, Geology, Vegetation, Evaporation, Topography, Runoff, Precipitation (Atmospheric), Sediment transport, Water quality, Turbidity, Dissolved solids, Geochemistry, Evaluation.
Identifiers: *Natural water pollution.

This report explores the meaning of natural pollution in an arid lands surface-water system, generalizes a definition for this pollution and speculates on the possible consequences of the pollution thus defined. During periods of precipitation, the surface flow is usually loaded with relatively high concentrations of particulate matter which increases the corrosive quality of the water, and its turbidity. High evaporative losses result in a concentration of solids dissolved from the geological formations making up the watershed and the silt loads carried by the runoff. Most definitions agree that pollution implies a change in quality as a result of man's use. Similarly, the term natural can be variously defined. It can include or exclude the influence of man. Two approaches to natural pollution considering man are that first, man is considered part of an ecosystem which he can manipulate but only to the limit of available resources or to levels of limiting factors before collapse of the system results. What affects the system affects him. In the second approach, man sets himself apart from the system. He manipulates it to maximize his immediate economic gain. In the first, and ecological ethic of land and water use is inherent. In the second, it is nonexistent. (See also W71-06111) (Woodard-USGS)
W71-06113

ANIMAL WASTE RUNOFF--A MAJOR WATER QUALITY CHALLENGE,
Federal Water Quality Administration, Kansas City, Mo. Missouri Basin Region.
Anthony V. Resnik, and John M. Rademacher.
In: Water Quality Management Problems in Arid Regions, Federal Water Quality Administration Water Pollution Control Research Series 13030 DYY 6/69, p 95-105, October 1970. 11 p, 25 ref.

Descriptors: *Water pollution sources, *Livestock, *Wastes, *Surface waters, *Groundwater, Cattle, Hogs, Sheep, Seepage, Runoff, Streams, Lakes, Streamflow, Organic wastes, Biochemical oxygen demand, Water quality, Nitrates, Abatement, Planning, Water pollution control.
Identifiers: *Feedlots.

Animal wastes contaminate water supplies, destroy fish and aquatic life in streams, and generally degrade water quality. More important, it is also known that animal wastes are a controllable major source of water pollution necessitating immediate attention. Since feedlots have generally been located without regard to the soil inventory and topographic characteristics, surface runoff to streams with subsequent damage from high BOD wastes is common. Infiltration of nitrates from manures to well waters is documented. Sixty-six thousand feedlots, ranging in capacity up to 100,000 animals blanket 7 to the 10 Missouri Basin States. Animal wastes from the more than 20 million cattle, 16 million swine and 7 million sheep defecate wastes equivalent to 370 million people. The human population of the Missouri Basin Region is 7.9 million. Assuming that 5% of the animal waste enters the streams, the calculated stream pollution from animal wastes in the basin is more than twice the human population equivalent. The extent of the problem as well as the effects on surface and groundwaters are illustrated with research data. The present status of legislation in regulatory control of pollution is discussed. Measures to strengthen present regulations are proposed. (See also W71-06111) (Woodard-USGS)
W71-06114

NITRATE POLLUTION OF WATER,
Illinois State Water Survey, Urbana.
Julius H. Dawes, Thurston E. Larson, and Robert H. Harmeson.
In: Frontiers In Conservation, Proceedings 24th Annual Meeting Soil Conservation Society of America, August 10-13, 1969, Colorado State University, Fort Collins, p 94-102, 1970. 9 p, 8 fig, 6 tab, 6 ref.

Descriptors: *Water pollution sources, *Groundwater, *Surface waters, *Nitrogen compounds, Illinois, Hydrologic cycle, Fertilizers, Industrial wastes, Decomposing organic matter, Organic wastes, Domestic wastes, Livestock, Precipitation (Atmospheric), Water quality, Chemical analysis, Soils, Soil water, Seepage, Sorption, Crops, Nitrates.

Nitrogen levels in surface waters that exceed established standards are evidence of mans intrusion in the environment and the cause of deterioration in water quality. Thirty-nine million tons of chemical fertilizers were applied in the United States in 1967, of which approximately 6 million tons was nitrogen. In Illinois about 25% of all water samples from wells 50 feet deep or less have been found to contain an excessive concentration of nitrate, that is, above the 45 milligrams per liter level. The sources of nitrogen in Illinois surface and subsurface waters are varied and often difficult to identify. Known sources of pollution include precipitation, human wastes, crop residues, decomposing animal or plant tissue, industrial wastes, and nitrogen fertilizer. At the present time there is no

known practical and economical way of recovering these excess nitrates. Membrane techniques and biological methods both have potential for preventing pollution of water by nutrients, salts, and minerals, whether the source is fertilizer, irrigation water, sewage, or industrial wastes. (See also W71-06129) (Woodard-USGS)
W71-06130

WATER QUALITY AT THE DADE-COLLIER TRAINING AND TRANSITION AIRPORT, MIAMI INTERNATIONAL AIRPORT, AND COTTONMOUTH CAMP-EVERGLADES NATIONAL PARK, FLORIDA, NOVEMBER, 1969,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 05A.
W71-06158

THE MONOCACY RIVER-PHYSICAL, CHEMICAL AND BACTERIOLOGICAL WATER QUALITY REPORT NUMBER 1, MARCH-DECEMBER 1966,
Maryland Dept. of Water Resources, Baltimore. Div. of Water Quality Investigations.
Charles R. De Rose.
Maryland Division of Water Quality Investigations Report, December 1967. 108 p, 16 fig, 11 tab, 20 ref, 2 append.

Descriptors: *Water pollution sources, *Rivers, *Water quality, *Maryland, *Data collections, Domestic wastes, Industrial wastes, Land use, Chemical analysis, Streamflow, Discharge measurement, Runoff, Sampling, Coliforms, Dissolved oxygen, Biochemical oxygen demand, Water temperature, Methodology, Nitrates, Phosphates, Color, Dissolved solids.
Identifiers: *Monocacy River basin (Md).

During 1966, water quality of the Monocacy River was determined from 21 stations located in the 58-mile section of the Maryland portion of the river from the mouth to the Pennsylvania State line. Sixteen major tributaries were included with stations located near the mouths of the streams. Additional stations were located on 6 streams to study the effect of sewage treatment plant discharges. Water quality was studied and compared with criteria for dissolved oxygen, biochemical oxygen demand (B.O.D.), pH, and coliform bacteria. Wide variations in stream flow occurred frequently and affected the water quality. The water quality in the middle section of the Monocacy River, which included a 22-mile section of river above the Frederick City sewage treatment plant discharge, was generally good. Minimum dissolved oxygen concentrations remained at about 5.0 ppm. Of the 16 major tributaries studied, Carroll Creek was found to be severely polluted and a large contributor to the pollution load borne by the Monocacy River. (Woodard-USGS)
W71-06176

MONTHLY VARIATION IN PHOSPHATE AND RELATED CHEMICALS FOUND IN THE SEDIMENT IN THE ISLAND AREA OF LAKE ERIE, 1967-68, WITH REFERENCE TO SAMPLES COLLECTED IN 1964, 1965, and 1966,
Ohio State Univ., Columbus. Water Resources Center.
N. Wilson Britt, and Edwin J. Skoch.
Available from NTIS as PB-198 128, $3.00 in paper copy, $0.95 in microfiche. Ohio Water Resources Center Project Completion Report No 333X, 1970. 30 p, 3 tab, 6 fig, 33 ref. OWRR Project A-008-OHIO (2).

Descriptors: *Lake Erie, *Phosphorous, *Iron, *Eutrophication, Great Lakes, Mud-water interfaces, Dissolved oxygen, Water pollution sources.
Identifiers: *Bottom sampling, *Sediment analysis, Substrate, Organic carbon, Oxygen consumed.

Samples of sediment collected in 1964, 1965, 1966, and on a monthly basis from May 1967 through November 1968, were analyzed for total phosphate, iron and organic carbon. Samples were collected by means of a core technique developed by E. J. Skoch. The cores were sectioned at 2.5 cm intervals and each of the six sections was analyzed for the same factor. Results of the analyses showed only a slight increase in phosphate since 1964. However, all those factors showed a definite increase from May 1967 through November 1968. The two sampling methods yielded slightly different results. The sediment was found to consist of two distinct layers, with the upper 5 cm of sediment being usually higher in concentrations of materials than the lower portion.
W71-06187

REMARKS ON THE DRIFT OF OILY WASTE IN THE BAY OF HELGOLAND (IN GERMAN),
Deutsches Hydrographisches Institut, Hamburg (West Germany).
Heinrich Neumann.
German, English and French abstracts. Deutsche Hydrographische Zeitschrift, Vol 22, No 2, 1969. 6 ref.

Descriptors: *Oil, *Sludge, *Drifting, Ships, Damages, Water pollution sources.
Identifiers: *TMS Maria Xilas, German Bight.

The discharge of oil, surface drift, and oil sludge settling, after damages to the ship, TMS 'Maria Xilas', were studied. The role of offshore factors in the drift process is discussed. The drift of oil lumps beneath the surface and effects of seaway and surges which can eventually carry the lumps from sea bottom to surface and on to shore are investigated. (Ensign-PAI)
W71-06206

POLLUTION OF AMERICAN COASTS BY OIL (IN GERMAN),
R. Adam.
Wasser, Luft und Betrieb, International, Vol 14, No 7, July 1970, p 289.

Descriptors: *Water pollution control, *Oil wastes, *Seepage, Accidents, Coasts.
Identifiers: North America, England.

The increase of coastal pollution from oil spills, seepage and underwater oil drilling accidents is considered. Reference is made to the Santa Barbara oil spill and the grounding of a tanker off the coast of England. (Ensign-PAI)
W71-06208

POLLUTION, BY BIOSYNTHESIS 'IN SITU' OF CARCINOGENOUS HYDROCARBONS, OF A LAGOON BIOCENOSIS 'IN VITRO' REPRODUCTION OF THIS PHENOMENON (IN FRENCH),
Centre de Recherches du Service de Sante des Armees, Paris (France). Division de Biologie Generale et Ecologie.
P. Niaussat.
French and English Summaries. Revue Internationale D'Oceanographie Medicale, Vol 17, p 87-98, 1970. 4 tab, 20 ref.

Descriptors: *Oil, *Anaerobic bacteria, *Phytoplankton, Water pollution sources.
Identifiers: Biosynthesis, Biocenosis, Benxo-3-4-Pyrene.

A hydro-biological investigation of marine biocenosis in the isolated lagoon of Clipperton indicated that in a natural environment with an absence of industrial pollution biosynthesis of some carcinogenous hydrocarbons, particularly benzo-3-4-pyrene, is possible. This hypothesis was confirmed by experimentation. In mixed cultures of marine phytoplankton and bacteria, growing rate of benzo-3-4-pyrene was demonstrated in terms of time culture. The interruption of bacterial growth by utilization of antibiotics stabilizes the increase of this hydrocarbon's rate. (Ensign-PAI)
W71-06209

AERIAL PHOTOGRAPHIC TRACING OF PULP MILL EFFLUENT IN MARINE WATERS,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
Fred J. Burgess, and Wesley P. James.
Copy available from GPO Sup Doc as I67.13/4-12040EBY 08/70, $1.25; microfiche from NTIS as PB-198 232, $0.95. EPA-WQO Report 12040 EBY August 1970. 152 p, 11 tab, 68 fig, 20 ref, 6 append. EPA-WQO Grant WP-00524.

Descriptors: *Pulp and paper industry, *Waste water disposal, *Remote sensing, *Aerial photography, Industrial waste, Sewage effluents, Oceans, Coasts, Outlets, Mixing, Diffusion, Currents (Water), Bioassay, Temperature, Water pollution sources, Path of pollutant.

Aerial photography taken of waste plumes from Kraft pulp mill ocean outfalls was shown to be an effective tool in the study of waste disposal sites. This technique is not limited by sea conditions and permits monitoring and evaluation of outfall sites throughout the year. Photography taken at one instant provides comprehensive information throughout the waste field. Manpower requirements and costs for this method are considerably less than for conventional boat sampling surveys. Field studies were conducted on the waste plumes from Kraft pulp mill ocean outfalls at Newport and Gardiner, Oregon and Samoa, California. Waste concentrations were measured by conventional boat sampling techniques while aerial photography was taken of the outfall area from altitudes ranging from 3,000 to 11,000 ft. Computerized procedures were used to compute water currents, waste concentrations, toxicity zones and diffusion coefficients from the photography. The highest concentration measured directly over the outfalls was 2.3 percent waste by volume and the maximum area of influence with concentrations greater than 0.2 per cent waste was 155 acres. The maximum concentration determined over the outfall for each field study was generally less than that shown to have a detrimental effect on young salmon for a 14-day exposure. Surface water current was found to be the dominant factor in the resulting plume pattern. During periods of low current velocities in the receiving water, the hydraulic head created by the effluent source was a significant factor in the result ing plume shape. The steady state form of the Fickian diffusion equation and unidirectional transport velocity was not applicable to the majority of the observations. (Burgess-Oregon State)
W71-06258

LIQUID WASTE EFFLUENTS FROM A NUCLEAR FUEL REPROCESSING PLANT,
Northeastern Radiological Health Lab, Winchester, Mass.
P. Magno, T. Reavey, and J. Apidianakis.
Available from NTIS as PB-196 442, $3.00 in paper copy, $0.95 in microfiche. Technical Report BRH/NERHL 70-2, November 1970. 59 p, 19 fig, 27 tab, 9 ref.
Identifiers: *Radioactive contaminants, *Water pollution, *Nuclear fuel reprocessing, Water pollution, Concentration (Composition), Tritium, Ruthenium isotopes, Strontium 90, Cesium 137, Cesium 134, Purex process, Radioactive isotopes, Stream pollution, New York, Sampling, Dilution, Mixing, Sediments, Ruthenium 106, *Water pollution detection, Cattaraugus County (New York).

The liquid waste effluents from a commercial nuclear fuel reprocessing plant were studied in detail during a six-month period May through October 1969. The concentrations and amounts of individual radionuclides discharged from the plant were measured and the amounts of sedimentation of individual radionuclides in the lagoon system were estimated. Tritium, ruthenium-106, strontium-90, cesium-137 and cesium-134 were the principal radionuclides discharged to the environment during this period. No relationship could be established between the amount and burnup of fuel processed and the amount of activity discharged from the plant to the lagoon system during this study. For the Yankee fuel campaign of May-August

1969, the waste management practice and not the amount of fuel processed was the controlling factor in the amount of activity discharged from the plant to the lagoon system. Simultaneous sampling was carried out at the point of discharge of the waste and several locations on the Buttermilk and Cattaraugus Creeks. Tritium, ruthenium-106, and strontium-90 were the radionuclides present in the highest concentrations in these streams during these periods. Stream dilution and absorption factors were calculated for individual radionuclides at various locations along the stream system.
W71-06269

ABSTRACT OF PROCEEDINGS, HAZARDOUS POLLUTING SUBSTANCES SYMPOSIUM: ANNEX 1 TO STUDY ON CONTROL OF HAZARDOUS POLLUTING SUBSTANCES, SEPT. 14-16, 1970. NEW ORLEANS, LA.
Coast Guard, Washington, D.C.

Available from NTIS as PB-195 342, $3.00 in paper copy, $0.95 in microfiche. September 1970. 561 p.
Identifiers: *Water pollution, *Hazardous materials, *Water transportation, Water pollution, *Industrial wastes, Water pollution, Water quality, Meetings, Definitions, Government policies, Law jurisprudence, Economic analysis, Detection, Stream pollution, Oceans, Insurance, *Water pollution, Oceans, Insurance, *Water pollution detection, Water pollution damage.

A symposium was held with its principal objective being the solicitation of the views of industry, academic leaders, conservationists, state governments, and other non-federal government spokesmen on the identification and response to the uncontrolled release of hazardous polluting substances into the navigable waters of the United States. The symposium employed a panel format encompassing three areas: (1) definition and classification; (2) prevention, detection and removal; and (3) legal and economic factors. The report contains an abstract of the comments made by some 400 interested parties, along with the recommendations made by each panel.
W71-06270

A GENERAL REVIEW OF CONTINUOUS WATER QUALITY ANALYSIS INSTRUMENTATION,
Robert H. Jones.
Beckman Instruments, Inc. Process Instruments Division, Fullerton, Calif. 15 p.

Descriptors: *Instrumentation, *Monitoring, *Water quality.
Identifiers: *Water quality monitor.

Beckman Instruments, Inc. offers a multi-parameter Water Quality Monitor for continuous measurement of: disolved oxygen, temperature, pH, chloride ion, turbidity, oxidation-reduction potential, sunlight radiation intensity and conductivity. The new instrument features sensors which improve reliability of continuous monitoring while reducing maintenance requirements. This instrument is compatible with conventional forms of transmission and data handling. Pollutants in water such as silt, slimes, soluble and suspended solids, and algae coat and contaminate sensing elements. This paper explains Beckman's approach to this problem of continuous water quality monitoring.
W71-06295

CITY OF HARRISONVILLE V W S DICKEY CLAY MFG CO (ENJOINING CITY'S SEWAGE DISPOSAL INTO STREAM AS TEMPORARY NUISANCE).
For primary bibliographic entry see Field 06E.
W71-06304

INTRODUCTION: ISSUES IN FOOD PRODUCTION AND CLEAN WATER,
Agricultural Research Service, Beltsville, Md. Water Conservation Research Div.
For primary bibliographic entry see Field 05G.
W71-06429

POLLUTION BY SEDIMENT: SOURCES AND THE DETACHMENT AND TRANSPORT PROCESSES,
Iowa State Univ., Ames. Dept. of Agricultural Engineering; and Agricultural Research Service, Beltsville, Md. Water Conservation Research Div.
H. P. Johnson, and W. C. Moldenhauer.
Agricultural Practices and Water Quality, Iowa State University Press, Ames, Iowa, 1970, Chapter 1, p 3-20. 2 tab, 2 fig, 59 ref.

Descriptors: *Water pollution, *Sediments, *Sediment transport, Bed load, Suspended load, Soil erosion, Gully erosion, Sheet erosion, Rill erosion, Sediment yield, Watersheds, Iowa, Losses, Regression analysis, Specific weight, Streams, Yield equations.
Identifiers: *Detachment, *Erosion equation, Universal Soil Loss Equation, Correlation coefficient, Sediment delivery ratio, Reservoir sedimentation.

The paper attempts to identify problems in the sediment pollution area, define the present understanding of the erosion and transport process, and to indicate research needs. Gross erosion from land, including both sheet and gully erosion, is discussed, and empirical methods of quantitative measurement are presented as well as research approaches. Primary sources of sediment yield information are reservoir sedimentation surveys and suspended load samplings. Finally a look is taken at sediment in transport and its two components suspended load and bed load. The science of erosion and sediment transport needs to advance considerably if it is to be sufficiently flexible for use in detailed planning. (See also W71-05437) (White-Iowa State)
W71-06430

CHEMISTRY OF SEDIMENT IN WATER,
Agricultural Research Service, Morris, Minn. Soil and Water Conservation Research Div; and Minnesota Agricultural Experiment Station, St. Paul.
R. F. Holt, R. H. Dowdy, and D. R. Timmons.
Agricultural Practices and Water Quality, Iowa State University Press, Ames, Iowa, 1970, Chapter 2, p 21-34. 2 fig, 1 tab, 49 ref.

Descriptors: *Sediments, *Nitrogen, *Phosphorus, Chemistry, Water pollution, Clays, Mineralogy, Montmorillonite, Illite, Colloids, Clay minerals, Organic matter, Ions, Ion exchange, Cation exchange, Anion adsorption, Oxidation-reduction potential, Nitrification, Denitrification.
Identifiers: Preferential removal, Electrical charge, Surface area, Reduced layer, Surface oxidized layer.

Sediment can be considered a major pollutant of surface waters. However, its contribution to the dissolved chemicals in lakes and streams is largely unknown. The composition of sediment closely resembles the soil from which it is derived but is generally higher in silt, clay, and organic matter. Chemical reactions involving sediment are essentially the surface chemistry of their colloidal fractions which is a function of their surface area and electrical charge. As a result, reactions with sediment can be divided into interactions with charged ions and with neutral compounds. The chemistry of sediments in situ can be surmised from studies of submerged soils. Sediments carry relatively large amounts of total nitrogen and phosphorus into surface waters, but in both cases only a small proportion of this total is readily available to the biosystem. Sediments apparently have a high capacity to remove phosphate from solution, but without turbulence the release of phosphate from bottom sediments will not support algal growth at appreciable distances from the sediment. Available inorganic nutrients, particularly phosphorus, are rapidly taken up by the biosystem in natural waters. They eventually become a part of the organic fraction of the sediment and their release back to the waters is not well resolved. (See also W71-05437) (White-Iowa State)
W71-06431

SIGNIFICANCE OF PHOSPHORUS IN WATER SUPPLIES,
Southern Illinois Univ., Carbondale. Dept. of Botany.
Jacob Verduin.
Agricultural Practices and Water Quality, Iowa State University Press, Ames, Iowa, 1970, Chapter 5, p 63-71. 1 fig, 4 tab, 12 ref.

Descriptors: *Phosphorus, *Nutrients, Water pollution, Fertilizers, Oxygen, Nitrogen, Sewage, Effluents, Phosphates, Carbon dioxide, Odor, Taste, Eutrophication, Water sheds, Tennessee Valley Authority Project, Detergents, Farm wastes, Lagoons.
Identifiers: *Plant nutrients, N/P ratio, Enrichment.

The author gives data showing the marked increase in total phosphorus concentrations in our streams and lakes. Although there has been a large increase in agricultural fertilizer use, evidence suggests that approximately one-third of the phosphorus contributions may come from agricultural watersheds. In urban sewage effluents, detergents seem to contribute about three times more phosphate than is contributed by the organic matter in sewage. Consequently, detergents would appear to be the most significant single source of phosphates enriching our waters today. The author contends that animal and domestic wastes belong on the land as fertilizer and soil improvers rather than discharging nutrient rich lagoon and sewage plant effluents directly to streams. As such, agriculture has a primary role to play in the solution of the pollution problem. In the problem of removing concentrated nutrients from water, agricultural technology can make a major contribution in the application of the living root zone filter to the process of plant nutrient removal. (See also W71-05437) (White-Iowa State)
W71-06433

BEHAVIOR OF SOIL AND FERTILIZER PHOSPHORUS IN RELATION TO WATER POLLUTION,
Iowa State Univ., Ames. Dept. of Agronomy.
C. A. Black.
Agricultural Practices and Water Quality, Iowa State University Press, Ames, Iowa, 1970, Chapter 6, p 72-93. 10 fig, 1 tab, 57 ref.

Descriptors: *Phosphorus, *Soils, Water pollution, Phosphates, Fertilizers, Solubility, Organophosphorus compounds, Groundwater, Surface waters, Aqueous solutions, Saturation, Distribution, Adsorption.
Identifiers: *Orthophosphate, Plant residues, Concentrations, Biological cycle, Phosphorite, Langmuir equation, Reaction capacity.

The principal objective of this chapter is to present an account of selected aspects of the behavior of soil and fertilizer phosphorus as a basis for understanding how phosphorus from these sources may contribute to the phosphorus content of waters in the soil and leaving the soil. Chemical and geologic phosphorus cycles in the soil are traced. The reactions and distribution of fertilizer phosphorus in soil are described. The distribution of both inorganic and organic phosphorus is pointed out. (See also W71-05437) (White-Iowa State)
W71-06434

SOURCES OF NITROGEN IN WATER SUPPLIES,
Geological Survey, Denver, Colo.
Marvin C. Goldberg.

Agricultural Practices and Water Quality, Iowa State University Press, Ames, Iowa, 1970, Chapter 7, p 94-124. 4 fig, 8 tab, 72 ref.

Descriptors: *Nitrogen, *Nitrates, Groundwater, Ammonia, Precipitation, Sediments, Denitrification, Runoff, Ureas, Fertilizers, Drainage water, Irrigation, Return flow, Water supply, Livestock, Sewage, Infiltration, Industrial wastes, Algae, Ponds, Farm wastes.
Identifiers: *Surface waters, Geological sources, Mineralization, Nitrogen sources, Well water, Feedlots.

Water supplies can be categorized as surface waters or groundwaters. This paper examines representative studies of nitrate entrance to both types of water supplies, with summaries of some of the many laboratory and field studies described in the current literature. Some of the sources of nitrogen entrance to water supplies include atmospheric, geologic, rural and urban runoff, sewage, irrigation, animal wastes, and industrial wastes among many others. Sources of major importance to both surface and groundwater supplies are pointed out and field or laboratory studies are reported. (See also W71-05437) (White-Iowa State)
W71-06435

CHEMISTRY OF NITROGEN IN SOILS,
Illinois Univ., Urbana. Dept. of Agronomy; and Missouri Univ., Columbia. Dept. of Agronomy.
F. J. Stevenson, and G. H. Wagner.
Agricultural Practices and Water Quality, Iowa State University Press, Ames, Iowa, 1970, Chapter 8, p 125-141. 8 fig, 26 ref.

Descriptors: *Nitrogen, *Nitrates, *Ammonium compounds, Fertilizers, Inorganic compounds, Nitrites, Microorganisms, Climates, Nitrification, Denitrification, Leaching, Organic matter, Amino acids, Lignins, Chemistry, Soils.
Identifiers: *Fixation, Mineralization, Immobilization, Volatilization, Amines, Pyrimidine.

This review emphasizes the complex nature of soil nitrogen. Other than gaseous forms, the inorganic N consists primarily as NH4 (..) and NO3 (-). Part of the NH4 (..) is bound to colloidal surfaces and behaves according to classical reactions of exchange chemistry. Nitrate is free to move with the soil water and is the form of N which is of greatest concern from the standpoint of pollution of water supplies. Many soils contain appreciable amounts of NH4 (..) that cannot be utilized directly by plants and microorganisms; this NH4 (..) is held within the lattice structures of clay minerals. Less than one-half of the organic N in soils can be accounted for in known compounds (amino acids, amino sugars, purine and pyrimidine bases, etc.). The remainder may occur as part of the structures of humic and fulvic acids. Part of the N added to soils as fertilizers can be converted to organic forms by chemical reactions involving NH3 (..) and NO2 (-); this combined N is only slowly mineralized and may persist in soil for prolonged periods. Bacterial denitrification is an important factor regulating NO3 (-) levels in natural soil and may serve as a means of reducing the NO3 (-) content of groundwater when land is used for the disposal of nitrogenous wastes. (See also W71-05437) (White-Iowa State)
W71-06436

FERTILIZER MANAGEMENT FOR POLLUTION CONTROL,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 05G.
W71-06437

THE PESTICIDE BURDEN IN WATER AND ITS SIGNIFICANCE,
Federal Water Pollution Control Administration, Athens, Ga. Southeast Water Lab.
H. Page Nicholson.
Agricultural Practices and Water Quality, Iowa State University Press, Ames, Iowa, 1970, Chapter 12, p 183-193. 3 tab, 32 ref.

Descriptors: *Pesticides, *DDT, Toxicity, Dieldrin, Chlorinated hydrocarbon pesticides, Aldrin, Endrin, Heptachlor, Runoff, Water pollution, Industrial wastes, Insecticides.
Identifiers: *Environmental contamination, Concentrations, Sources, Parathion, Pesticide pollution.

Sources of pesticide polluted water include runoff, industrial wastes, accidents and carelessness. Graphic examples of each are given to gain perspective about the potential for pesticide involvement in water pollution. The significance of chlorinated hydrocarbon pesticides with respect to water pollution is shown. Concentrations in some lakes and streams has increased. A final section on control of pesticide pollution gives ideas and methods which should result in less water pollution by pesticides. (See also W71-05437) (White-Iowa State)
W71-06439

HERBICIDE RESIDUES IN AGRICULTURAL WATER FROM CONTROL OF AQUATIC AND BANK WEEDS,
Agricultural Research Service, Denver, Colo. Crop Research Div; and Agricultural Research Service, Laramie, Wyo. Crops Research Div.
F. L. Timmons, P. A. Frank, and R. J. Demint.
Agricultural Practices and Water Quality, Iowa State University Press, Ames, Iowa, 1970, Chapter 13, p 194-208. 4 tab, 31 ref.

Descriptors: *Herbicides, *2-4-D, *Aquatic weed control, Dalapon, 2-4-5-T, Alligator weed, Copper sulfate, Ponds, Pond weeds, Reservoirs, Irrigation canals, Sprinkler irrigation, Furrow irrigation, Drainage, Water hyacinth, Runoff.
Identifiers: *Herbicide dissipation, Drainage ditches, Submersed weeds, Amitrole, Silvex.

The effectiveness of herbicides and the economics involved in agricultural production have caused their extensive use for weed control in and adjacent to aquatic areas, especially on irrigation systems. Greater use of herbicides in and around agricultural waters may be expected. Maximum residues of herbicides used for weed control in farm ponds and reservoirs are low, ranging from a fraction of 1 ppm to several ppm. In most cases these levels are of short duration. The transport of herbicide residues in irrigation water prevents extensive exposure of any given irrigated area. The flowing water may at times carry residues to areas where their presence may be objectionable. While reduction in residue level varies with canal and herbicide, many residues are dissipated after a water flow of 10 to 15 miles. In most cases, the dissipation can be attributed to dilution in water or absorption by bottom mud. The concentrations of herbicides found in irrigation water are unlikely to cause injury in crops. Where residues were found in crops following irrigation with water containing herbicides, the levels were generally much lower than tolerances already established for the same or similar crops. (See also W71-05437) (White-Iowa State)
W71-06440

PESTICIDES AND PEST MANAGEMENT FOR MAXIMUM PRODUCTION AND MINIMUM POLLUTION,
Iowa State Univ., Ames. Dept. of Zoology and Entomology.
For primary bibliographic entry see Field 05G.
W71-06441

EFFECTS OF SURFACE RUNOFF ON THE FEASIBILITY OF MUNICIPAL ADVANCED WASTE TREATMENT,
Iowa State Univ., Ames. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W71-06445

NITROGEN AND AMINO ACIDS IN THE FECES OF YOUNG PIGS RECEIVING A PROTEIN-FREE DIET AND DIETS CONTAINING GRADED LEVELS OF SOYBEAN OIL MEAL OR CASEIN,
Guelph Univ. (Ontario). Dept. of Nutrition.
Kathleen H. Carlson, and H. S. Bayley.
Journal of Nutrition, Vol 100, No 11, p 1353-1361, 1970. 5 tab, 3 fig, 17 ref.

Descriptors: *Nitrogen, *Amino acids, *Proteins, *Diets, Farm wastes, Hogs, Water pollution sources.
Identifiers: Young pigs, Protein-free diets, Casein, Soybean oil meal.

Thirty-two piglets were weaned at 14 days of age and received a nutritionally complete diet; at 20 days of age they were allocated to either a protein-free diet, or diets containing 7, 14, or 21% protein from either soybean oil meal or casein. Feed consumed between 21 and 31 days of age was measured and the feces voided were collected. The n-butyl-N-trifluoroacetyl esters of the amino acids in hydrolysates of feed and feces were separated by gas-liquid chromatography. The amounts of fecal nitrogen and of each of the 13 amino acids of metabolic origin were calculated directly from the observations made on the protein-free diet and indirectly by regression analyses of the outputs of the piglets receiving the diets containing graded levels of protein. The metabolic fecal nitrogen excretion determined directly (111 mg. N.100 g. feed consumed) agreed more closely with other published values than the indirect estimates obtained by regressions. The direct values were used in calculating the corrected digestibilities of the nitrogen and of the amino acids in the two protein sources. The corrected digestibilities of the nitrogen and amino acids in the casein were very high (97 - 100%), but were lower for the soybean meal. There were significant differences in the corrected digestibilities of the individual amino acids in the soybean oil meal, which ranged from 82% for alanine to 93% for glutamic acid. The level of inclusion of casein did not influence the corrected digestibilities of the amino acids, but increasing the level of soybean oil meal in the diet caused a significant reduction in the corrected digestibilities of isoleucine, leucine and proline. (Christenbury-Iowa State)
W71-06451

5C. Effects of Pollution

MERCURY USES IN CANADA AND THEIR POSSIBLE HAZARDS AS SOURCES OF MERCURY CONTAMINATION,
University of Western Ontario, London. Dept. of Zoology.
For primary bibliographic entry see Field 05B.
W71-05861

THE ECOLOGY AND OCEANOGRAPHY OF SEWER OUTFALLS,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 06G.
W71-05928

EFFECT OF FEEDLOT LAGOON WATER ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF SOILS,
Kansas State Univ., Manhattan. Dept. of Agronomy, and Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
David O. Travis, W. L. Powers, L. S. Murphy, and R. I. Lipper.
Partially supported by OWRR, Dept. of Interior.
Soil Science Society of America Proceedings. Vol 35, No 1, p 122-126, January-February 1971. 5 p, 7 fig, 4 tab, 12 ref. OWRR Project A-016-KAN (2).

Descriptors: *Farm wastes, *Water pollution effects, *Path of pollutants, *Irrigation water, *Waste water disposal, Lagoons, Saline soils,

itrates, Salts, Leaching, Soil water, Soil chemis-y, Soil properties, Soil texture, Soil structure.
dentifiers: Feedlot lagoons.

agoon water from cattle feedlot runoff was added o undisturbed soil columns 42 cm long and 6.7 cm diameter. The infiltration rate of the lagoon ater into the columns was measured and ecorded. After each run, the soil columns were ectioned into 3-cm increments and analyzed for a, Mg, Na, K, and NH4 ions. Also the electrical onductivity of a saturation extract from the top 15 m of each column was determined. Water flow in he soil columns stopped for all soils before two ore volumes of filtrate could be collected. The ercentages of Na, K, and NH4 ions increased in he surface increments of the soil columns. The lectrical conductivity of the saturation extracts for ll soils was increased by more than 200% by ad-ing the lagoon water to the soil. The saturation ex-ract of the treated soils had electrical conductivity alues of between 2.80 and 5.05 mmhos/cm. (K-app-USGS)
W71-05974

EFFECTS ON PH ON THE LIFE CYCLE OF THE MIDGE TANYTARSUS DISSIMILIS,
Federal Water Quality Administration, Duluth, Minn. National Water Quality Lab.
Henry L. Bell.
Canadian Entomologist, Vol 102, No 5, p 636-639, 970. 2 tab, 10 ref. FWQA Program 18050 WAI 1/70.

Descriptors: *Toxicity, *Hydrogen ion concentra-ion, *Midge, *Bioassay, Life history studies, Lethal limits, Water limits, Water pollution effects, Life cycles.
dentifiers: *Ph toxicity.

All stages of the life cycle of the midge Tanytarsus (Paratanytarsus) dissimilis Joh. were subjected to ow pH and the extremes of tolerance were deter-nined. The life cycle could not be completed below a pH of 5.5
W71-05982

EFFECTS OF OIL POLLUTION ON WATER-OWL A STUDY OF SALVAGE METHODS,
Zoological Society of San Diege, Calif. Health Dept.
Lynn A. Griner, and Robert Herdman.
Copy available from GPO, SOD, No 67.13/4:15080EBZ 12/70, $0.50. Also available rom NTIS as PB-198 091, microfiche $0.95. Water Pollution Control Research Series 5080EBZ 12/70, December, 1970. 35 p, 2 tab, 13 g, 8 ref. EPA-WQO Program 15808 EBZ 12/70.

Descriptors: Water pollution effects, Oil, *Oil astes, *Oil water California, *Waterfowl, *Mal-rd duck, *Geese (Wild), *Ducks (Wild).
dentifiers: Santa Barbara (Calif), Grebes, Loons, uks, Murres.

A study was made of salvage methods for waterfowl ubjected to oil pollution. Mallard ducks were the rimary test species used. Aspects of the pathology f some of the waterfowl species involved in the anta Barbara oil slicks were also investigated. lthough some refined petroleum products contain oxic compounds, the Santa Barbara crude used as test oil in this study produced no apparent ill ef-ects. Polycomplex A-11 was found to be a rapid nd effective cleansing agent for the removal of oil om bird plumage. Oil on bird plumage alters eather structures by replacing the small air ockets between barbules of the feather, thereby ecreasing buoyancy and insulation. Removal of oil om down feathers is more difficult than from the ontour feathers. Ducks and geese are amendable treatment and post-treatment care than are the ore aquatic fowls, such as grebes, loons, auks and urres. Confinement times should be as brief as ossible, as the incidence of mycotic and other in-ctious diseases increases under long periods of ose confinement.
71-05983

PLANKTON DIATOM ASSEMBLAGES IN LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
E. F. Stoermer, and J. J. Yang.
Copy available from GPO, SOD, No I67.13/4:18050DKC. 12/69, $2.00. Also available from NTIS as PB-198 087, microfiche $0.95. Water Pollution Control Research Series 1805ODKC, 12/69, Dec 1969. 268 p, 65 ref, append. FWQA Program 18050 DKC.

Descriptors: *Plankton, *Diatoms, *Lake Michigan, Sampling, Population, Water pollution effects, Plants.
Identifiers: Diversity estimates.

The various elements of Lake Michigan plankton diatom flora, their seasonal cycles, and history of changes were determined and genera and species are listed. Absolute frequency, relative frequency, and contribution to diversity of each taxon were computerized. Occurrence of the different entities were recorded: those associated with certain water quality conditions; constitutents of only extremely oliogotrophic floras, rapidly replaced in disturbed portions of the lake; those more tolerant of changing conditions but rapidly reduced in abundance with extensive chemically measurable changes; other entities seemingly favored by slight increases in trophic level, flourishing in moderately disturbed portions of the lake, but declining when pollution increases; those formerly able to thrive only in naturally eutrophic estuaries and inshore areas, favored by increasing pollution and now flourishing in highly disturbed open lake areas; the final general group of dominant plankton species including those taxa, apparently not able to live in the original conditions of Lake Michigan but introduced following pollution. All of the plankton diatoms associated with extreme water quality degradation in the Great Lakes system are now present in Lake Michigan, indicating critical pollution levels. (Jones-Wisconsin)
W71-05984

REPORT ON BIOLOGICAL, CHEMICAL, AND GEOLOGICAL STUDIES OF BOIS BRULE AND POPLAR RIVER WATERSHEDS,
Wisconsin State Univ., Superior. Center for Lake Superior Environmental Studies.
Albert Dickas, Donald Bahnick, Donald Davidson, Joseph Horton, and Ronald Roubal.
Wisconsin Univ, Madison, Water Resources Center, 1970. 5 p. OWRR Project A-023-WIS (8).

Descriptors: *Rivers, *Eutrophication, *Forests, Streams, Erosion, Clays, Hydrogen ion concentration, Watersheds (Basins), Sedimentation.
Identifiers: *Deforestation, Specific conductance, Bois Brule River (Wis), Popular River (Wis).

A comparison of the eutrophication status of two rivers in northern Wisconsin revealed a pronounced negative influence of deforestation. The Bois Brule River with its forest surroundings is much less subjected to runoff than the Popular River located in a deforested watershed. The effect of forest cover is conspicuously reflected in dynamics of two chemical characteristics of water: only small fluctuation of pH value during rainy and rain-free periods, and a decrease rather than an increase in specific conductance on pluvial days. The reverse was observed on the Poplar River whose watershed includes highly erodible lacustrine clay. (Wilde-Wisconsin)
W71-05986

EUTROPHICATION STUDIES OF A SHALLOW INLET ON VANCOUVER ISLAND,
Fisheries Research Board of Canada, Nanaimo (British Columbia). Biological Station.
For primary bibliographic entry see Field 02L.
W71-05988

TOXICITY OF ZINC, COPPER AND LEAD TO CHLOROPHYTA FROM FLOWING WATERS,
Durham Univ. (England). Dept. of Botany.
B. A. Whitton.
Archiv fur Mikrobiologie, Vol 72, p 353-360, 1970. 1 tab, 7 ref.

Descriptors: *Indicators, *Algae, *Heavy metals, *Toxicity, Copper, Chlorophyta, Water pollution, Nutrients, Rivers, Lakes, Farm ponds.
Identifiers: *Zinc, *Lead, Stigeoclonium tenue, Cladophora glomerata, Ulotrichales, Zygnemales, Oedogonium, Mougotia, Sporotetras pyriformis, Gongrosira, Microspora, Spirogyra, Ulothrix.

The biological and economic interest of heavy metals in the relation to freshwater algae led to a survey of toxicity of zinc, copper, and lead to Chlorophyta in flowing waters. Twenty populations each of Stigeoclonium tenue and Cladophora glomerata were tested for variations in metal resistance. The only indication found was a slight increase in resistance to zinc of one Stigeoclonium population from a metal-polluted stream. Thirty-five other algal populations, representing about 25 species, were also tested. Comparison of these populations showed that in the test medium used Cladophora glomerata was the most or almost the most sensitive to all three metals. It was absent from streams known to be polluted by lead or lead and zinc. The Ulotrichales and most of the Zygnemales were relatively resistant to zinc, while all the Oedogonium species taken from the field were sensitive to zinc. However, an Oedogonium population highly zinc resistant was obtained from a zinc enriched laboratory tank. Because the medium used in the present experiments is relatively rich in nutrients such as phosphates it may well mask effects that would show in a less favorable environment. (Jones-Wisconsin)
W71-05991

MUSSELS (UNIONIDAE) OF THE RED RIVER VALLEY IN NORTH DAKOTA AND MINNESOTA, USA,
North Dakota Univ., Grand Forks. Dept. of Geology.
Alan M. Cvancara.
Malacologia, Vol 10, No 1, p 57-92, 1970. 9 fig, 4 tab, 44 ref. OWRR Project A-007-NDAK (1).

Descriptors: *Mussels, *Water pollution effects, North Dakota, Minnesota, Tributaries, River systems, Chlorides, Turbidity, Stagnant water.
Identifiers: *Red River (ND), Unionidae, Lampsilis siliquoidea, Lasmigona complanata, Anodonta grandis, Anodontoides ferussacianus.

This paper lists 13 species of mussels inhabiting the northern part of the Red River and 18 species in its tributaries in eastern North Dakota and western Minnesota. The most common species are: Lasmigona complanata, Anodonta grandis, Anondontoides ferussacianus, and Lamsilis siliquoidea. Although the Red River is a part of the Mississippi system, its fauna constitutes only 1/4th of the main stream. The restricted distribution of mussels is attributed to the prolonged lack of river flow, high content of chlorides, water pollution, and high turbidity. (Wilde-Wisconsin)
W71-06001

INFLUENCE OF INDUSTRIAL EFFLUENTS ON ARTHROPODS OF THE MARINE SUPRALITTORAL ZONE, (IN GERMAN),
Erlangen-Nuremberg Univ. (West Germany). Zoologisches Institut.
Hermann Remmert.
English summary. Oecologia (Berl), Vol 5, p 158-164, 1970. 3 tab, 10 ref.

Descriptors: *Sea water, *Marine animals, *Oil, *Water pollution effects, Industrial wastes, Mortality, Toxicity, Insects.
Identifiers: *Arthropods, *Oil pollution, Burning oil, Crude oil.

Both investigated organisms, the fly Limosina brachystoma, and the amphipod Orchestia platensis, can survive for several weeks in foliage moistened with 1.5% solution of sodium chloride.

Yet, pollutants of burning oil in contact with water are fatal to these organisms even in very low concentrations. The air, however, is freed from the toxic ingredients within one week. Crude oil which floated in the sea for a prolonged period also is not poisonous to the arthropods or their larvae. On the other hand, the organisms, especially Orchestia, have a very low resistance against sulfuric acid. (Wilde-Wisconsin)
W71-06003

EUTROPHICATION: CAUSE--EFFECT RELATIONSHIPS,
Florida Univ., Gainesville. Dept. of Environmental Engineering.
Earl E. Shannon, and Patrick L. Brezonik.
Dep of Environmental Engineering, Florida University, Gainesville (Undated). 59 p, 4 fig, 13 tab, 30 ref. OWRR Project B-004-FLA (3).

Descriptors: *Lakes, *Trophic level, *Florida, Eutrophication, Watersheds, Analysis, Color, Indicators, Primary productivity, Chlorophyll, Nitrogen, Phosphorus, Transparency, Conductivity, Regression analysis.
Identifiers: Trophic state indices.

This study was concerned with the relationship between the trophic state of 55 Florida lakes and their watershed characteristics. On the basis of cluster analysis, the lakes were grouped into 24 colored and 31 relatively clear lakes. All of the lakes were further subdivided into trophic groups delineated by values of 7 trophic state indicators: primary production, chlorophyll a, total organic nitrogen, total phosphorus, disc transparency, conductance, and sodium .. potassium:calcium .. magnesium ratio. Multiple regression analyses revealed a significant relationship between values of trophic state indices (TSI) and characteristics of watersheds including land use, extent of fertilizer treatments, and density of population. Canonical analyses of trophic variables and eutrophication-causing factors gave similar results. (Wilde-Wisconsin)
W71-06009

REACTION RATES OF PHOTOSYNTHESIS,
Green Engineering Affiliates, Somerville, Mass.
M. M. Varma, and R. S. Talbot.
Proceedings Industrial Waste Conference, 20th, May 4, 5, 6, 1965, Purdue University, Vol XLIX, No 4, July 1965, p 146-174. 20 fig, 5 tab, 33 ref.

Descriptors: *Light intensity, *Photosynthesis, *Chlamydomonas, Aquatic environment, Aquatic microorganisms, *Hydrogen ion concentration, *Temperature, Water pollution effects.
Identifiers: Buffer.

Investigations were made to study the effect of changing intensity of light, pH, temperature, and age culture on the rate of photosynthesis of Chlamydomonas. Observations of the rate of photosynthesis were made with a sodium bicarbonate-carbonate buffer and a potassium bicarbonate-carbonate buffer. Studies were also made to establish a correlation between the weight and number per unit volume of Chlamydomonas organisms using the gravimetric method and the membrane filter technique. The rate of photosynthesis increased with temperature at a given initial pH and light intensity. Under given conditions, there is optimum light intensity at which the rate of photosynthesis is a maximum and the intensity of light is more critical at 25C than at 30C. It was also found that essentially a straight line relationship exists between weight and number per volume of Chlamydomonas. (Ellis-Texas)
W71-06039

DEGRADATION OF WATER QUALITY IN IRRIGATION RETURN FLOWS,
Robert S. Kerr Water Research Center, Ada, Okla.; and Oklahoma State Univ., Stillwater. Dept. of Agronomy.
For primary bibliographic entry see Field 03F.
W71-06063

INTRODUCTION, PROCEEDINGS OF 2ND THERMAL WORKSHOP OF UNITED STATES INTERNATIONAL BIOLOGICAL PROGRAM,
Maryland Univ., College Park.
J. A. Mihursky, and J. B. Pearce.
Chesapeake Science, Vol 10, No 3, p 125-127, Sept-Dec, 1969.

Descriptors: *Thermal pollution, Temperature, Environmental engineering, Heat, Thermal powerplants, Aquatic plants, Aquatic life, Water pollution.
Identifiers: Temperature effects.

Highlights of the second Thermal Workshop held at the Chesapeake Biological Laboratory of the University of Maryland, Nov. 3-7, 1968, are outlined. The conference theme centered on the effects of temperature and temperature change on the aquatic environment. It was stated that aquatic inhabitants have specific and seasonal temperature requirements that must not be exceeded. Constructive use of waste heat has sound theoretical foundations. Temperature alterations resulting from man's activities have caused changes in distribution and abundance in plant and animal population. Temperature alterations were recognized as only one of many instances of accelerated environmental modification due to man's activities. (Novotny - Vanderbilt)
W71-06075

BIOLOGICAL REACTIONS AND PATHOLOGICAL CHANGES OF HUMAN BEINGS AND ANIMALS UNDER THE CONDITION OF ORGANIC MERCURY CONTAMINATION,
Kumamoto Univ. (Japan). Medical School.
Tadao Takeuchi.
Presented at International Conference on Environmental Mercury Contamination, Ann Arbor, Michigan, 1970. 30 p, 76 ref, 16 fig, 11 tab.

Descriptors: *Heavy metals, Water pollution effects, Human pathology, Diseases, Epidemiology, Toxicity, Water quality, Water pollution, Air pollution, Chemical wastes, Industrial wastes.
Identifiers: Mercury pollution, Mercury effects, Mercury contamination.

Organic mercury contamination results from (1) some mercury residue produced in chemical plants; (2) fungicides used widely in farms, (3) erratic use of disinfectants and fungicides for medical supplies and clothes and, (4) other unknown factors. Factors (1) and (2) are connected with the dumping of mercury into the water from the chemical industry. On the basis of investigations on Minamata disease brought about by organic mercury contamination, the biological reactions and pathological changes were discussed. The clinical symptoms of the disease are cerebellar atoxia, constriction of visual fields, and dysarthria. Other symptoms are those resulting from the lesion of the cerebral cortex and peripheral nerves, particularly sensory peripheral nerves of extremeties. It was found that alkylmercury, particularly methylmercury compounds may contaminate environmental subjects with the effluent from the plants and they are absorbed by organisms, accumulated in some organs and tissues, and give rise directly and indirectly to various disturbances of human beings and animals. (Novotny-Vanderbilt)
W71-06076

THE ABSORPTION OF MERCURY FROM FOOD, ITS SIGNIFICANCE AND NEW METHODS OF REMOVING MERCURY FROM THE BODY,
Rochester Univ., N.Y.
T. W. Clarkson, and R. E. Shapiro.
Presented at Symposium on 'Mercury and Man's Environment', February 15 and 16, 1971, Royal Society of Canada, Ottawa. Typescript, 9 p, 2 tab, 3 fig.

Descriptors: *Heavy metals, *Toxicity, *Food Fish, Metals, Water pollution, Water pollution effects, Food chains, Human pathology, Wastes, Environmental engineering.
Identifiers: Mercury, Mercury pollution.

According to studies in Sweden and the USA, the mercury present in fish muscle is in the form methyl mercury compounds. The form of mercu in non-aquatic food products is, as yet, genera undefined. The experimental results of the kinet of the mercury metabolism in experimental anim (mice) is presented. Three stages of mercury co tamination can be distinguished: (1) state of creased mercury level, (2) steady state, when take of mercury from food is exactly balanced excretion, and (3) after removing the animals fr exposure to mercury, the amount in the bo declines. The problem of mercury in food is methyl mercury problem. A new means of rem ing methyl mercury from the body could trapping mercury in the intestines so as to prev reabsorption. Polystyrene resins were used for t purpose. Mice fed food with 1% resin excre mercury 3 times faster than control mice, and, af 22 days, had only 20% of the mercury level in br tissue as the controls did. (Novotny-Vanderbilt)
W71-06080

EMBRYOTOXICITY OF MERCURY CO POUNDS,
Food and Drug Directorate, Ottawa (Ontari Div. of Toxicology.
David J. Clegg.
Presented at Symposium on 'Mercury and Ma Environment', February 15 and 16, 1971, Ro Society of Canada, Ottawa. Typescript, 9 p.

Descriptors: *Heavy metals, *Human patholo *Toxicity, Pathology, Animal pathology, Diseas Environmental effects, Epidemiology, Water pol tion, Nutrient requirements, Food chains.
Identifiers: *Mercury, Metals effects, Mercury p lution, Mercury effects.

The information currently available regarding t embryotoxic activity of the alkyl mercurial co pounds is reviewed. These compounds appear to the mercury compounds of most crucial concern man. In the case of the alkyl mercurial compoun the embriotic effects apparently result from dir toxic action of the parent compound on the foe or embryo, and possibly also by damaging t gametes prior to fertilization. Alkyl mercurials c exert embryotoxic, or teratogenic activity laboratory animals. Human data available fr Japan are also discussed and these confirm the i plications from laboratory animal studies. T minimum dose level tested (mg/kg-day) h resulted in indications of embryotoxic activity in least one experiment. The present temporary a ceptable daily intake, according to Swedish es mate, of 0.0004 mg/kg-day is based upon hum blood levels in cases of minimal signs of hum mercury intoxication. This figure may have to reduced as further information becomes availab (Novotny-Vanderbilt)
W71-06081

THE EFFECTS OF THERMAL DISCHARG ON THE STRATIFICATION CYCLE OF LAKE
Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
T. R. Sundaram, and R. G. Rehm.
AIAA 9th Aerospace Sciences Meeting, N York, AIAA Paper No 71-16, January 25-27, 197 11 p, 4 fig, 1 tab, 22 ref.

Descriptors: *Stratification, *Lakes, *Powerplan Epilimnion, *Thermal pollution, Thermocli Temperature, Mathematical models.
Identifiers: Thermal discharges.

The effects of power-plant thermal discharges the seasonal stratification cycle of temperate lak are considered. A theoretical model, which i cludes the interaction between wind-induced tu bulence in the lake and the buoyancy gradients d

o surface heating as well as the thermal discharges, s developed and solved numerically for some typi- al cases. It is shown that the thermal discharges in- rease the temperature during spring homothermy, nd the stratification period. The increases in tem- peratures due to thermal discharges, are greater at leeper levels than at the surface. Under certain onditions, thermal discharges may lead to a reduc- ion in the epilimnetic volume. This article contains 22 references. (Upadhyaya-Vanderbilt)
W71-06082

THE EFFECT OF VARYING AND CONSTANT TEMPERATURES ON THE SIZE OF A MARINE COPEPOD,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
Anthony R. Lock, and Ian A. McLaren.
Limnology and Oceanography, Vol 15, No 4, p 638-640, July 1970. 2 tab, 10 ref.

Descriptors: *Thermal pollution, Temperature, Foods, Light, Size.
Identifiers: Marine copepods.

One-hundred stage three copepodites of Pseudocalanus Minutus were reared to maturity in the laboratory in an excess of food at about 5, 8, and 12C. Mean length of adult females was inversely related to temperature, but that of adult males was unaffected. Mean length of females reared in a light-temperature regime of alternately 12 hr. at 8C in weak light and 12 hr. at 12C in darkness did not differ significantly from estimated mean length at a constant, intermediate temperature of 10C. These experiments suggest that vertical migration in thermally stratified waters will not enhance length of this species. (Upadhyaya-Vanderbilt)
W71-06083

THE MIXING OF A SHALLOW SUBMERGED HEATED WATER JET WITH AN AMBIENT RESERVOIR,
Maryland Univ., College Park. Dept. of Mechanical Engineering.
Bal M. Mahajan, and James E. A. John.
AIAA 9th Aerospace Sciences Meeting, New York, AIAA Paper No 71-17, p 12, January 25-27, 1971. 12 fig, 1 tab, 3 ref.

Descriptors: *Thermal pollution, *Temperature, Heated water, Dimensional analysis, Velocity, Heat transfer, Mixing.
Identifiers: *Shallow submerged jet, Two-dimensional, Prandtl number.

The work reported here is an attempt to provide information on the discharge of submerged turbulent two-dimensional hot water jet near the surface of a reservoir. Experimental tests were made in a tank 8 ft. long and 6 inches wide and 4 ft. deep, with jet velocity 8 fps and jet temperature 0C, 50C and 60C above the tank temperature. Velocities were measured with a hot film probe, temperatures with copper constantan thermocouples. Empirical dimensionless correlations were obtained which yielded the path of the point of maximum velocity of the jet as it moved towards the surface. Below the point of maximum velocity, velocity and temperature distributions were similar to those of a deeply submerged jet. Above this point, temperatures were considerably higher than those of a deeply submerged jet. The buoyancy, in the case of the heated water jet has negligible effect on the flow pattern of a shallow submerged jet, but has significant effects on the flow patterns of a deeply submerged jet. (Upadhyaya-Vanderbilt)
W71-06084

VERTICAL DIFFUSIVITY COEFFICIENT IN A THERMOCLINE,
Department of Energy, Mines and Resources, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 02H.
W71-06088

THERMAL POLLUTION, AQUACULTURE AND PATHOBIOLOGY IN AQUATIC SYSTEMS,
Maryland Dept. of Research and Education, Solomons. Chesapeake Biological Lab.
J. A. Mihursky, A. J. McErlean, and V. S. Kennedy.
Journal of Wildlife Diseases, Vol 6, p 347-355, October 1970. 6 fig, 31 ref. OWRR Project A-002-MD (8).

Descriptors: *Thermal pollution, *Temperature, *Aquatic life, *Pathology, Aquatic environment, Animal pathology, Plant pathology, Biology, Thermal powerplants, Fish, Aquatic bacteria, Environmental engineering.
Identifiers: Temperature effects.

The effect of higher than normal temperatures on aquatic life are discussed. Thermal-biotic predictive models that describe two categories of temperature relationships to estuarine fauna have been developed. The expected present temperature increase due to steam electric stations is about 5-15C. The temperature increase, besides the possible lethal influence on aquatic organisms, may also result in sub-optimal physiological conditions from the standpoint of pathology, which means that this state presents an opportunity for pathogenic organisms to overcome their host species. A number of operational factors from steam electric stations other than temperature are responsible for detrimental effects on aquatic organisms (chlorine, heavy metals, mechanical effects). A closed recycle and reuse waste water system to produce useful foodstuff is proposed and discussed. (Novotny-Vanderbilt)
W71-06092

TEMPERATURE CONTROL IN OUTDOOR EXPERIMENTAL PONDS,
Minnesota Univ., Minneapolis.
H. Stefan, E. Silberman, P. Vaidyaraman, and W. Geiger.
St. Anthony Falls Hydraulic Laboratory, Proj Rep No 116, Dec 10, 1970. 16 p. FWQA Program 18050 euj.

Descriptors: *Temperature control, *Ponds, *Heat transfer, Cooling, Heating, Model studies, Research facilities, Evaporation, Conduction, Radiation, Temperature, Environmental engineering, Air temperature, Water temperature, Heat balance, Heat exchangers, Thermal pollution.
Identifiers: Experimental models.

A system of outdoor experimental ponds for the study of aquatic life under the effect of various controlled water temperatures has been designed. The ponds were to be located near power plants in Minnesota. The purpose of the study is to determine the feasibility of maintaining certain specified temperature regimes in the proposed ponds. This was done by considering the available heating and cooling capacity and the environmental conditions prevailing at the selected site and making design calculations for the major elements of the system. Firstly, the limits of feasible temperature control were determined. Secondly, heating and cooling systems were devised and thirdly, a method of control was developed. For cooling, use of the well water is proposed, and, for heating, the water released from the thermal power station is going to be used. External and internal heat exchange systems were examined and both were found to be feasible and adequate. The study has the character of a feasibility study. (Novotny-Vanderbilt)
W71-06093

THERMAL CRITERIA - A MEASURE TO CONTROL THERMAL POLLUTION,
New York State Dept. of Health, Albany.
Satyendra P. Mathur, and Donald B. Stevens.
Presented January 1970 at Cooling Tower Institute in New Orleans. Transcript. 10 p.

Descriptors: *Temperature standards, *Thermal pollution, Thermal power plants, Temperature, Temperature effects, Cooling, Streams.

The major source of thermal pollution is cooling water released from different industries, i.e. steam electric plants, shell mills, etc. The effect of thermal discharges on the receiving waters can be divided into three broad categories: physical, chemical, and biological. The New York State approach to controlling discharges of heated waters is discussed. As a thermal discharge a waste (cooling) water with temperature greater than 70 deg F is understood. Thermal criteria are adopted for fresh and tidal waters. The criteria for all categories (non-trout waters, trout waters and lakes; coastal waters and estuaries) are discussed. (Novotny-Vanderbilt)
W71-06096

POWER PLANTS: EFFECTS OF CHLORINATION ON ESTUARINE PRIMARY PRODUCTION,
Maryland Dept. of Research and Education, Solomons. Cheasapeake Biological Lab.
D. H. Hamilton, Jr., D. A. Flemer, Carolyn W. Keefe, and J. A. Mihursky.
Science, Vol 169, p 197-198, July, 1970.

Descriptors: *Thermal powerplants, *Chlorination, *Aquatic microorganisms, Water pollution, Water quality, Primary productivity, Estuaries, Photosynthesis, Temperature, Thermal pollution.
Identifiers: Effects of chlorination.

Steam electric stations may reduce primary production of cooling water by 91 percent as a result of chlorine applications for control of fouling organisms. Bacterial densities and concentrations of chlorophyll are also reduced. Slight stimulation of production may occur in the absence of chlorination. Based on the available supply of 'new' water a maximum loss of primary production of 6.6 percent for the adjacent tidal segment of the Patuxent River was calculated. The results of experiments designed to examine the effect of plant operation on primary productivity are presented. (Novotny-Vanderbilt)
W71-06097

ALGAECIDAL EVALUATION AND ENVIRONMENTAL STUDY OF MAT PRODUCING BLUEGREEN ALGAE,
Bureau of Reclamation, Denver, Colo. Office of Chief Engineer.
For primary bibliographic entry see Field 04A.
W71-06102

SOME ASPECTS OF BIOLOGY OF CARCINUS MAENAS (L) II SURVIVAL AT LOW SALINITY,
University of Strathclyde, Glasgow (Scotland). Dept. of Biology.
E. J. Perkins, E. Gribbon, and R. B. Murray.
The Transactions of the Dumfriesshire and Galloway Natural History and Antiquarian Society, 3rd ser vol 46, p 27-28, 1969. 4 ref.

Descriptors: *Salinity, *Crabs, Salt tolerance, Predation, Lethal limit.
Identifiers: Aspects, Carcinus maenas, Green shore crab.

The green shore crab, Carinus maenas, is an important predator of animals dwelling in inshore waters. In the laboratory, crabs were subjected to a range of salinity from 1.0 to 8.4%, with the mean temperature 8.4 deg. Salinities slightly less than 2% were rapidly lethal. Between 2 - 3% survival was dramatically improved for 1-34 days. Size was important in survival up to 6%, but of 5% large and small animals survived equally well. (Wahtola-Washington)
W71-06179

TEMPERATURE SELECTION AND HEAT RESISTANCE OF THE MOSQUITO FISH, Gambusia affinis,
Arkansas Univ., Fayetteville.
Edmond j. Bacon, Jr., William H. Neill, Jr., and Raj V. Kilambi.

Proc of the 21st Annual Conference of the Southeastern Association of Game and Fish Commissioners, p 411-416, 1967. 3 fig, 5 ref. OWRR Project A-007-ARK (3).

Descriptors: *Temperature, *Heat resistance, *Fish, Thermodine, Sexual maturity, Fish physiology, Warm water fish.
Identifiers: Gambusia affinis, Thermal distribution, Mosquito fish.

The temperature selection and heat resistance of the mosquito fish is described. The average selected temperature of a sample of Gambusia affinis previously acclimated to 20 deg C decreased from 28-29 deg C to about 27 deg C after the fish had lived in a temperature gradient tank for one month. The final thermal distribution of the fish varied with sex and developmental stage. Males selected lower temperatures than did adult females. The young fish, although more scattered than the adults, occurred mostly at temperatures higher than those selected by the adults. These results may indicate temperture separation of young and adult fish in nature which would reduce intraspecific predation and competition. Heat resistance of adult females taken from the 26.2 deg C-compartment of the temperature-gradient tank was higher than the resistance of 28.0 deg C acclimated fish. The temperature-gradient females either had attained a high acclimation level by temporarily venturing above 28.0 deg C or had accumulated high resistance by living at varying temperatures below 28.0 deg C. (Wahtola-Washington)
W71-06180

THE EFFECTS OF THE HERBICIDES DIQUAT AND DICHLOBENIL (CASORON) ON POND INVERTEBRATES PART I. ACUTE TOXICITY,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
Dennis C. Wilson, and Carl E. Bond.
Transactions of the American Fisheries Society 98: p 438-443, 1969. 7 tab, 15 ref.

Descriptors: *Herbicides, *Toxicity, *Bioassay, *Invertebrates, *Aquatic insects, Dragonflies, Mayflies, Caddisflies, *Amphipoda, Lethal limit, *Diquat, Water pollution effects, 2-6-Dichlobenil.
Identifiers: *TL50, Casoron, IC50, Damselflies, Baetidae, Lunnephilidae, Coenagrionidae, Libellulidae.

The acute toxicity was determined for the herbicide Diquat and Dichlobenil. The median tolerance limits (TLm) of Diquat (1:1-ethylene-2:2'-dipyridylium dibromide) and Dichlobenil (2,6-dichlorobenzonitrile) to one amphipod and larvae of five species of aquatic insects were determined. Diquat was over 300 times more toxic to the amphipod (Hyalella azeteca) than to the mayfly (Callibaetis sp.) while the caddisfly (Limnephilus sp.), tendipedid (Tendipedidae), damselfly (Enallagma sp.), and dragonfly (Libellula sp.) in that order, were more resistant. The addition of pond mud to the test vessels changed the 96-hour TLm of Diquat for the amphipod from 0.046 to 6.8 mg/liter. Dichlobenil was less toxi than Diquat to the amphipod but more toxic to the aquatic insects. Dichlobenil had a narcotizing effect that was recorded as an immobilization concentration (IC50). The addition of pond mud did not reduce the toxicity of Dichlobenil to the caddisfly. The 4% granular formulation of Dichlobenil had a 72-hour 'lag' before an effective concentration was obtained equivalent to the toxic effect of the 50% wettable powder. Dichlobenil formed a strong layer at the bottom of the test vessel and was more toxic with time to the invertebrates than to the fishes Micropterus salmoides and Lepomis marochirus. (Wahtola-Washington)
W71-06181

DISSOLVED OXYGEN CRITERIA FOR THE PROTECTION OF FISH,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
Peter Doudoroff, and Dean L. Shumway.
American Fisheries Society Special Publication No. 4, p 13-19, 1967. 3 fig, 16 ref.

Descriptors: *Dissolved oxygen, Fish physiology, Fisheries, Growth rates, Embryonic growth stage, Energy budget, Juvenile growth stage, Standards, Water quality, *Freshwater fish.

The rates of growth and embryonic development and the activity of fish can be limited by the supply of oxygen even when dissolved oxygen concentrations are near or above air-saturation levels. Oxygen concentrations well below 3 mg/liter can be tolerated for long periods by the fish and fish embryos. Fishery biologists should decline to specify any particular dissolved oxygen level as a minimal requirement of any fish population or as a proper standard of water quality unitl the necessary clear guidelines or explicit definitions of terms are provided by pollution-control agencies desiring such simple criteria. The dissolved oxygen level at which growth of fish is limited by the oxygen supply depends on the amount of food available, as well as other environmental factors such as temperature. No reduction of dissolved oxygen below natural levels probably is the only 'standard' that would afford complete protection for fishery resources under all circumstances, but adoption of this standard for the regulation of waste disposal usually would be unrealistic and unnecessary. Any lower or less restrictive standards applicable over wide ranges of temperature probably should be expressed as oxygen conentrations (mg/liter) rather than as percentages of saturation. They should be designed to prevent, by limiting diurnal or other fluctuations of dissolved oxygen, frequent exposure of fish to nonlethal but very low dissolved oxygen levels even for periods of moderate duration. The choice of suitable criteria or standards probably should be based in part on bioenergetic considerations relating to fish growth and production rates, but it is not simply and entirely a biological problem. (Wahtola-Washington)
W71-06182

EFFECTS OF ALKYL BENZENE SULFONATE ON BREEDING BEHAVIOR OF FLAGFISHES, Jordanella floridae,
Academy of Natural Sciences of Philadelphia, Pa.
Neal R. Foster, and John Cairns, Jr.
The ASB Bulletin, Vol 13, No 2, April 1966. 34 p. NIH Grant EF-00266.

Descriptors: *Water pollution effects, Bioassays, Detergents, Breeding, Killifishes, Alkylbenzene sulfonates, Fish behavior, Toxicity.
Identifiers: Jordanella floridae, Flagfish.

The Florida flagfish, Jordanella floridae Goode and Bean, is well suited for bioassays involving effects of toxicants in breeding behavior. Under optimum conditions, these killifishes spawn virtually daily in laboratory aquaria. Male flagfishes occupy specific bottom territories and defend these. A female can enter a male's territory and solicit spawning by undergoing a color change and 'backing' towards him in a distinctive fashion. After spawning, the male fans the substrate where the eggs were laid. Under test conditions, flagfish exhibit normal breeding behavior for at least four days' exposure to an introduced concentration of 6 p.p.m alkyl benzene sulfonate mixture (54.8% active ingredients). Significantly less breeding behavior was observed, and no viable eggs were recovered, in concentrations of 11.5 p.p.m. and 24 p.p.m ABS mixture. (Wahtola-Washington)
W71-06184

'KEROSENE' TAINT IN SEA MULLET (Mugil cephalus Linnaeus),
Department of Primary Industries, Brisbane (Australia).
E. M. Grant.
Fisheries Notes, Department of Harbours and Marine, Vol 3, No 1, 1969. 13 p, 1 tab, 6 ref.

Descriptors: *Mullets, Water pollution effec
*Taste, Fisheries, *Fish diets, Oil wastes, C
water, Odor.
Identifiers: *Mugil cephalus, Kerosene taint, A
tralia.

Sampling showed that fishermen were leaving lai
schools of sea mullet in the belief that they w
'kerosene'-tainted, the actual level of tainting v
quite low (0.28 per cent). Also, the level of taint
sessed at this time by fishermen greatly exceed
that derived from a consumer panel. Consumpti
of 'kerosene'-tainted sea mullet produces a m
unpleasant kerosene-like after-taste, but no oth
effects were noted. Although 'kerosene'-tainted
mullet are abundant in the vicinity of Lugga
Point (Brisbane R.), only about one-half of the
mullet of the area are so affected. 'Kerosen
tainted sea mullet also occur in Noosa R., a re
tively unpolluted stream 75 sea miles north of
Brisbane R. It is extremely improbable that
fected fish had migrated from the Brisbane R.
the Noosa R. 'Kerosene'-tainted sea mullet fr
Luggage Point were active and apparently healt
They had been feeding heavily on a dark-gr
sludge which had a metallic smell and a faintly
tringent taste. Even some small fish (9-inch) w
strongly 'kerosene'-tainted. (Wahtola-Washingt
W71-06185

ALGICIDES,
Wisconsin Univ., Madison. Water Resour
Center.
George P. Fitzgerald.
Available from NTIS as PB-198 130, $3.00
paper copy, $0.95 in microfiche. Wisconsin Un
Madison, Water Resources Center, Eutrophicati
Information Program, Literature Review No
1971. 50 p, 1 fig, 9 tab, 153 ref. OWRR Project
117No 1614) (3).

Descriptors: *Algicides, *Algae, *Algal contr
Testing, Laboratory tests, Chemicals, Bacter
cides, Cultures, Test procedures, Pesticide toxici
Resistance, Lakes, Reservoirs, Swimming poo
Chelation, Application methods, Cooling towe
Water pollution effects.
Identifiers: Detoxification, Synergism, Fish pon
Algistatic activity, Algicidal activity.

An evaluation of algicides--what they are, th
usage, how they are tested, their efficiency, a
methods of application--is presented. Detailed a
appropriate test organisms, culture and test med
the importance of algicidal versus algestatic effec
and effective chemical concentrations required
achieve potential toxicity. Characteristics of
algal problem, together with its environment,
fluence the methodology of application process
as well as detoxification, resistance, and synergis
Algal problems of water supply reservoirs a
recreational lakes, fish ponds, swimming pools, a
cooling towers are specifically discussed with su
gestions for effective application of toxicants
their control. (Auen-Wisconsin)
W71-06189

**SELECTIVE WITHDRAWAL AT LAK
LIVINGSTON, PRELIMINARY EVALUATIO
1969,**
Texas Univ., Austin. Center for Research in Wat
Resources.
E. G. Fruh.
Available from NTIS as PB-198 131, $3.00
paper copy, $0.95 in microfiche. Center f
Research in Water Resources Report, No 5
Progress Report No 1, June 1970. 102 p, 29 tab,
fig, 19 ref, 7 append. OWRR Project B-040-TE
(1).

Descriptors: *Computer programs, Model studie
Nutrients, Microbiology, Bioassay, Water analys
Texas, Water pollution effects, Water pollut
control.
Identifiers: *Selective withdrawal, *Lake Livin
ston, Kohn-Debler, Bohan-Grace, Trinity River.

A literature survey was conducted to evaluate the significance of selective withdrawal models available. Field investigations were made at several lakes and Lake Livingston to substantiate these models and to determine the changes in water quality of the Trinity River as Lake Livingston fills. The Koh-Debler and Bohan-Grace models were used to compare data from the literature with observed results from Lake Travis. The various inputs of data and the effect of varying these inputs upon the predicted water outlet temperature were investigated. It is concluded that a broader range of test must be run before either model can be applied with confidence to Southwestern U.S. impoundments. During the tests for water quality at Lake Livingston it was found that a high influx of oxygen demanding substances and nutrients enter the reservoir via the Trinity River. Turnover of water in the reservoir also affected water quality. Selective withdrawal did not appear to be feasible for water depths less than 40 feet but the data indicated the selective withdrawal programs at greater depths will be successful. (Ellis-Texas)
W71-06193

THE LIFE OF MICROBES IN THE SEA AND THE CURRENT POLLUTION OUTLOOK (IN FRENCH),
Poitiers Univ. (France). Faculte de Medicine et de Pharmacie.
Jean Brison.
English summary. Revue Internationale D'Oceanographie Medicale, Vol 17, p 127-244, 1970. 15 ref.

Descriptors: *Seashores, *Water pollution abatement, *Water pollution control, Outlets, Bacteria, Self-purification, Public health.
Identifiers: *Population explosion.

Pollution of the seashore by bacteria, virus and parasites is well established. The increase of population and the demographic growth have been found to follow a parallel curve. The phenomena or natural self-purification is no longer possible with the volume of pollution in today's environment. The consequences and long term effects of this constant contamination are not yet fully determined. The author feels it should be recognized that the situation has become alarming and cooperation from everyone is needed. Accent should be placed first on prevention and then on control. (Ensign-PAI)
W71-06202

ANTIBACTERIAL SUBSTANCES PRODUCED BY MARINE BACTERIA (IN FRENCH),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
M. Gauthier.
English and French Summaries. Revue Internationale D'Oceanographie Medicale, Vol 17, p 23-45, 1970. 3 tab, 5 graph, 22 ref.

Descriptors: *Marine bacteria, *Pseudomonas, *Biodegradation, *Self-purification, Water pollution effects.
Identifiers: Antibacterial substances, Lipo-Polysaccharides, Chromobacterium.

The antibiotic products synthesized by some marine bacteria were studied bacteriologically and biochemically. The activity of several strains of chromobacterium and the lipo-polysaccharides discharged in the culture media are investigated. Self purification or the endogenous microbial antagonism of these products is discussed. (Ensign-PAI)
W71-06203

STUDY OF THE INFLUENCE OF BDELLORIBRIO BACTERIOROUS IN MARINE SELF-PURIFICATION (IN FRENCH),
S. Daniel.
French and English Summaries. Revue Internationale d'Oceanographie Medicale, Vol 15, No 16, p 61-102, 1969. 17 fig, 12 tab, 35 ref.

Descriptors: *Microorganisms, *Bacteria, *Parasitism, *Self-purification, Water pollution effects.
Identifiers: Bdellovibrio bacteriovorus.

Action of the microorganisms and bacterial parasites in the phenomena of marine purification is evaluated. Bdellovibrio bacteriovorus are located in rivers and polluted areas near the seashore. Their presence in the marine environment is associated with the bacterial pollutants that they parasitize and they are sensitive to the antibacterial properties in seawater. (Ensign-PAI)
W71-06204

POSSIBILITY OF STUDYING THE EFFECTS OF POLLUTION ON BENTHIC ORGANISMS EMPLOYING IMMERSED PANELS (IN FRENCH),
Centro di Studio sulla Corrosione Marina dei Metalli, Genoa (Italy).
G. Relini, Oliva Dabini, and L. Ferretti.
English summary. Revue Internationale D'Oceanographie Medicale, Vol 17, p 189-199, 1970. 2 tab, 2 fig, 20 ref.

Descriptors: *Water pollution, *Pollutants, *Benthos, *Fouling, Water pollution effects.
Identifiers: *Asbestos panel method, Genoa Harbour.

Hydrological and biological investigations were conducted in several areas of Genoa harbour subjected to different types of pollution. Relationships between fouling organisms and pollution were studied with asbestos panels immerged at the various experimental stations. (Ensign-PAI)
W71-06205

THE OCCURRENCE OF POLYCYCLIC AROMATIC CARBOHYDRATES IN COASTAL WATERS AND ITS POSSIBLE EFFECTS ON MAN'S HEALTH (IN GERMAN),
M. J. Suess.
English, French, German and Spanish Summaries. Archiv fuer Hygiene und Bakteriologie, Vol 154, No 1, p 1-7, June 1970, Italy, October 2, 1969. 4 tab, 46 ref.

Descriptors: *Oil wastes, *Distribution, *Aquatic life, Water pollution effects, Public health.
Identifiers: *Carcinogenic polyciclic aromatic hydrocarbons.

Carcinogenic polyciclic aromatic hydrocarbons (PAH) are distributed widely throughout the world and are found in coastal waters near heavily populated areas as well as remote unpopulated sites. Endogenic synthesis of flora appears to be a major contributor. Concentrations of PAH in estuaries and coastal waters may be increased by industrial and municipal wastes and atmospheric precipitation. The concentration of carcinogenic PAH in marine fauna used for human consumption was pointed out. However, no definite evidence exists that wastes polluting our seafood is an actual cancer threat to the general public. These possibilities, it is suggested, should not be overlooked in order to prevent possible complication in the future. (Ensign-PAI)
W71-06207

ANTIBACTERIAL ACTIVITY OF A MARINE DIATOM ASTERIONELLA NOTATA (GRUN) (IN FRENCH),
M. Gauthier.
English and French Summaries. Revue Internationale d'Oceanographic Medicale, Vol 15, No 16, p 103-171, 1969. 17 fig, 23 tab, 77 ref.

Descriptors: Water pollution control, *Microorganisms, *Diatoms, Water pollution effects.
Identifiers: *Asterionella notata, *Cellular extract.

Asterionella notata Grun were investigated in solid media and liquid media. Properties of the cultures and antibiosis of the diatom was studied. The cellular extract of this marine micro-algae was found to be specific against many aerobic terrestrial saprophyte, some marine bacteria, fungi and yeasts. This cellular extract's active substance is secreted by the algae in its own culture media and may be able to fight -in situ- against the terrestrial polluting bacterial flora. (Ensign-PAI)
W71-06211

MAYFLY DISTRIBUTION AS A WATER QUALITY INDEX,
Winona State Coll., Minn.
For primary bibliographic entry see Field 05A.
W71-06248

SOME FACTORS INFLUENCING TOXICITY OF LINEAR ALKYLATE SULFONATE (LAS) TO THE BLUEGILL,
National Water Quality Lab., Duluth, Minn.
Kenneth E. F. Hokanson, and Lloyd L. Smith, Jr.
Transactions of the American Fisheries Society, Vol 1, No 1, p 1-12, January 1971. 3 fig, 10 tab, 22 ref. Paper No 6880, Scientific Journal Series, Minn. Agricultural Experiment Station, St. Paul, MN.

Descriptors: *Linear alkylate sulfonate, *Water pollution effects, *Bluegill, *Life history studies, *Bioassay, Lethal limit, Detergents, Hardness (Water), Oil, Water temperature, Dissolved oxygen, Toxicity, Surfactants, *Water quality.
Identifiers: *Mississippi River, Lethal threshold concentration, Application factor, Bentonite suspensions.

Some factors influencing toxicity of linear alklate sulfonate (LAS) on the early life history stages of the bluegill, Lepomis macrochirus (Rafinesque), were studied in raw Mississippi River water under ambient conditions and under controlled conditions in well water. Median response varied from 0.2-10 mg/l LAS with the life history phase and environmental conditions. Variation in estimation of TLm values within and between similar tests was small in comparison to the influence of external factors. The most important environmental factors related to lethal threshold concentration of LAS were dissolved oxygen, water hardness, and acclimation to LAS. High temperature decreased the median tolerance limit only during tests of short exposure. Sublethal concentrations of LAS increased toxicity of fuel oil mixtures while bentonite suspensions up to 200 mg/l had little influence on LAS toxicity. The most sensitive stage of development was the feeding sac-fry, while the most tolerant stage was the newly hatched sac-fry. Eggs and fingerlings had similar intermediate tolerance limits. Egg fertilization was the least inhibited of the events studied. A concentration of 1 mg/l LAS is considered to be a first approximation of a safe concentration for bluegills in Mississippi River water of good quality.
W71-06260

MARINE WASTE DISPOSAL AND SEA URCHIN ECOLOGY,
California Inst. of Tech, Pasadena.
John S. Pearse, Mary E. Clark, David L. Leighton, Charles T. Mitchell, and Wheeler J. North.
June 1970. 93 p, 8 tab, 32 fig, 21 ref. FWQA Program 18050 DNV.

Descriptors: Water pollution effects, Waste disposal, California, Outlets, *Plankton, *Nutrients, *Dissolved solids.
Identifiers: *Sea urchins, Kelp beds, Nutrient assimilation, Leptopel.

Between 1940 and 1960, certain kelp beds near submarine sewer outfalls in southern California deteriorated seriously. Dense urchin populations were observed destroying plants and preventing floral restoration. Economic losses totalled many millions of dollars. Possibly wastes nourish urchins and promote kelp bed deterioration by enhancing urchin survival. Our laboratory studies established

four potential nutritional pathways: (1) Urchins can absorb and assimilate dissolved organics. (2) Deposited organic-rich films (leptopel) can be eaten. (3) Larger plankton can be captured and eaten. (4) Microplankton and colloids can probably be assimilated. Outfalls probably contribute significantly to these pathways. Dissolved free amino acid concentrations were over 50 percent higher near an outfall vs. a control area. Leptopel deposits are always conspicuous near outfalls but elsewhere are often undetectable. High turbidities from suspensoids are characteristic of waste dispersal areas. Young urchins from barren outfall areas displayed about half the growth rates measured in well-fed laboratory animals. Barren outfall areas had higher proportions of large urchins compared to barren control areas. Proximity to an outfall ensured relatively high and constant nutritional condition (as measured by gonadal index). Compared to urchins in similar control areas, populations near outfalls were better nourished.
W71-06262

LACTIC AND PYRUVIC ACID CHANGES IN BLUEGILL SUNFISH (LEPOMIS MACROCHIRUS RAFINESQUE) DURING GRADUAL HYPOXIA AT TWO ACCLIMATION TEMPERATURES (5 and 20C),
Virginia Polytechnic Inst., Blacksburg.
Dennis T. Burton.
The ASB Bulletin, Vol 17, No 2, p 35, April 1970.

Descriptors: *Fish physiology, *Acclimatization, *Animal metabolism, Sunfishes, Oxygenation, Oxygen requirements, Anaerobic conditions, Laboratory tests, Dissolved oxygen, Stress, Thermal stress.
Identifiers: *Lactic acid, *Pyruvic acid, *Hypoxia.

Changes in skeletal muscle and liver lactate and pyruvate concentrations during the development of hypoxia were studied at two acclimation temperatures, 5 and 20C. Experimental fish were exposed to a gradual eight-hour hypoxic stress. At both acclimation temperatures lactic acid increased in both muscle and liver at very low oxygen concentrations; the pyruvic acid concentration was relatively constant. Thus the lactate/pyruvate ratio increased at low oxygen concentrations. Lactic acid was higher at 20C than at 5C. Pyruvic acid concentrations were similar at both temperatures. Fish at 5C could tolerate lower oxygen concentrations than those at 20C, thus suggesting that acclimation to cold temperatures has survival value for fish exposed to hypoxia. (Sjolseth-Washington)
W71-06320

THE INFLUENCE OF ACCLIMATION TEMPERATURE ON THE LIPID COMPOSITION OF FISH GILL MITOCHONDRIA,
Duke Univ., Beaufort, N.C. Marine Lab.
Richard S. Caldwell, and F. John Vernberg.
Comp Biochem Physiol, Vol 34, p 179-191, 1970. 3 tab, 1 fig, 48 ref. NSF Grant G-17669.

Descriptors: *Acclimatization, *Fish physiology, *Lipids, *Biochemistry, Water pollution effects, Water temperature, Environmental effects, Gas chromatography, Animal metabolism, Bullheads, Thermal stress, Mode of action, Biological membranes.
Identifiers: *Phospholipids, *Fish gill mitochondria, *Fatty acids, *Thermal acclimation.

The phospholipid fraction of goldfish gill mitochondria contained proportionately more cardiolipin and phosphtidyl ethanolamine and less sphingomyelin at 10C than at 30C but total phospholipid phosphorous levels remained unchanged. The total mitochondrial lipids from both goldfish and yellow bullhead gill tissues were more unsaturated at the colder acclimation temperatures. Generally, the levels of saturated and monounsaturated fatty acids were reduced and polyunsaturated fatty acids were increased in both species at the lower temperature. Changes in mitochondrial lipid composition presumably assist in maintaining a specific molecular organization over a wide range of environmental temperatures. (Sjolseth-Washington)
W71-06321

A POTENTIAL CONTROL FOR LEECHES,
Bureau of Sport Fisheries and Wildlife, Stuttgart, Ark. Fish Farming Experiment Station.
Fred P. Meyer.
The Progressive Fish Culturist, Vol 32, p 160-163, July 1970. 16 ref, 1 tab.

Descriptors: *Fish parasites, *Bioassay, *Toxicity, *Evaluation, Chemcontrol, Fish management, Organophosphorous pesticides, Carbamate pesticides, Fish hatcheries, Fishkill.
Identifiers: *Leeches, *Dylox, *Baygon, *Baytex, Placobdella parasitica, Erpobdella punctata, Illinobdella moorei, Piscicola salmositica, Theromyzon.

Leeches pose a large problem in fish hatcheries as they have been responsible for numerous fish losses. Controls for leeches are generally unknown. The purpose of this study was to determine the toxicity of Dylox, Baytex (organophosphorous pesticides) and Baygon (a carbamate pesticide) to five species of leeches; Erpobdella punctata, Illinobdella moorei, Pisciocola salmositica, Placobdella parasitica and Theromyzon sp. All three insecticides affected the leeches but only Dylox, at levels of 0.25 ppm and above, appeared to cause permanent damage to all species. The author feels that Dylox has potential as a control agent for leeches and merits further study. (Sjolseth-Washington)
W71-06322

SOME EFFECTS OF ANTIMYCIN IN AN OLIGOTROPHIC LAKE,
Idaho Univ., Moscow. Dept. of Biological Sciences.
Fred W. Rabe, and Robert C. Wissmar.
The Progressive Fish-Culturist, Vol 31, p 163, July 1969.

Descriptors: *Antimycin-A, *Toxicity, *Fishkill, *Fish food organisms, *Zooplankton, Fish toxins, Fish control agents, Fish management, Benthic fauna, On-site investigations, Daphnia, Cutthroat trout, Idaho, Water pollution effects, Lakes.
Identifiers: *Copper Lake (Idaho), Tin Lake (Idaho).

Antimycin A was applied to Copper Lake in Idaho at a rate of 5 parts per billion. Within 24 hr there occurred a total fish kill of 282 cutthroat trout. Ten days after the poisoning, a sample of six 1-inch cutthroat exposed to the water died within 12 hr. A year before this treatment, plankton hauls in Copper Lake and in nearby Tin Lake had provided counts of 31 and 33 microcrustaceans per liter respectively. Thirteen days after poisoning, no living crustaceans were found in Copper Lake samples, but 82 per liter were found in Tin Lake samples. A year after poisoning Copper and Tin Lakes yielded 25 and 43 microcrustaceans per liter respectively. (Sjolseth-Washington)
W71-06323

METABOLISM OF QUINALDINE (2-METHYLQUINOLINE). UPTAKE AND EXCRETION BY NURSE SHARKS,
National Inst. of Neurological Disease and Stroke, Bethesda, Md. Lab. of Neurochemistry.
Eberhard G. Trams, and Elise A. B. Brown.
Life Sciences, Vol 9, Part 2, p 27-35, 1970. 3 fig, 1 tab, 7 ref.

Descriptors: *Sharks, *Quinaldine, *Excretion, Kinetics, Water pollution effects, *Metabolism, *Absorption, Fish physiology.
Identifiers: Nurse sharks, Sheepshead, Cow-nosed rays.

The studies demonstrated that the uptake and excretion of quinaldine in the nurse shark appear to follow certain rules of kinetics. It was assumed that the rate of uptake and excretion in the experiments was partially dependent on the transport limits o the gills. It was thought conceivable that the lipo philic drug may be absorbed and excreted, in partr by the skin. The preliminary observations on the tissue distribution of quinaldine showed apprecia ble concentrations in the central nervous system Quinaldine should become a valuable drug for the handling of a variety of fish. (Wahtola-Washing ton)
W71-06324

EFFECTS OF ALKYL BENZENE SULFONATE ON RAINBOW TROUT,
Utah State Univ., Logan. Dept. of Wildlife Resources.
T. J. Hassler, J. M. Neuhold, and W. F. Sigler.
U.S. Department of the Interior, Bureau of Sportr Fisheries and Wildlife, Technical Papers No 16, 1967. 15 p, 6 fig, 6 tab, 31 ref.

Descriptors: *Alkylbenzene sulfonates, *Rainbow trout, *Detergents, *Bioassay, Toxicity, Mortality, Laboratory equipment, Tracers, *Fish physiology, Fish behavior, *Respiration, Lethal limit.
Identifiers: *LC-50, Hematocrits, Leucocytes, Mucous cells, Sulfur-35.

The effects of alkyl benzene sulfonate on rainbow trout, Salmo gairdneri, were described. Toxicity of detergent levels was determined by probit analysis. Effects on gill tissues and blood were noted and measured. The LC-50 was 3.48 mg/liter ABS after 24 hr exposure, and 2.53 mg/liter after 120 hr. Initial increase in respiratory rate was followed by loss of equilibrium, violent and erratic swimming, lethargy and death. Microhematocrit values, circulating red blood cells, total plasma proteins, leukocytes, and the number of mucus cells on the gill filament tips increased as ABS concentration increased, and decreased with time. Destruction of gill tissues was severe. The respiratory surface was greatly reduced by lysis and clumping of the lamellae. Edema in the epithelial cells of the lamellae and thrombi in the capillaries were evident. (Wahtola-Washington)
W71-06325

A PRELIMINARY STUDY OF THE FEEDING RELATIONSHIPS OF FISH IN A HARD-WATER AND A SOFT-WATER STREAM IN SOUTHERN ENGLAND,
Freshwater Biological Association, Wareham, (England). River Lab.
R. H. K. Mann, and D. R. O. Orr.
Journal of Fisheries Biology, Vol 1, p 31-44, 1969. 6 fig, 5 tab, 24 ref.

Descriptors: *Food habits, Statistics, Fish populations, Aquatic insects, Seasonal, Water pollution effects, *Trout, *Salmon, *Bullheads, *Minnows, Hydrogen ion concentration, Alkalinity, Conductivity, *Hardness (Water), Fish physiology.
Identifiers: Soft water.

The feeding relationships of fish in hard-water and soft-water streams in southern England are reported. The results can be summarized as follows: (1) the food of trout, salmon, bullheads, minnows and sticklebacks from a chalk stream, and trout and minnows from an acid stream were investigated by examination of 2659 stomachs collected between October, 1965 and September 1967, (2) although fish at each stream feed on similar invertebrate organisms, they do so in different proportions and these proportions may vary with the size of the fish, species of fish, season and type of habitat, (3) variation in fish diets within samples is often greater than between successive monthly samples, and (4) Docken's Water trout eat more Plecoptera nymphs and Gammarus than Bere Stream trout, but less Ephemeroptera nymphs and molluscs. (Wahtola-Washington)
W71-06327

AN ELECTRODE CHAMBER FOR RECORDING RESPIRATORY AND OTHER MOVEMENTS OF FREE-SWIMMING ANIMALS,
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 05A.
W71-06328

INTRODUCTION: ISSUES IN FOOD PRODUCTION AND CLEAN WATER,
Agricultural Research Service, Beltsville, Md. Water Conservation Research Div.
For primary bibliographic entry see Field 05G.
W71-06429

CHEMISTRY OF SEDIMENT IN WATER,
Agricultural Research Service, Morris, Minn. Soil and Water Conservation Research Div; and Minnesota Agricultural Experiment Station, St. Paul.
For primary bibliographic entry see Field 05B.
W71-06431

SIGNIFICANCE OF PHOSPHORUS IN WATER SUPPLIES,
Southern Illinois Univ., Carbondale. Dept. of Botany.
For primary bibliographic entry see Field 05B.
W71-06433

CHEMISTRY AND METABOLISM OF INSECTICIDES,
Iowa State Univ., Ames. Dept. of Zoology and Entomology.
Paul A. Dahm.
Journal Paper No. J-6509 of the Iowa Agriculture and Home Economics Experiment Station, Ames, Iowa. Agricultural Practices and Water Quality, Iowa State University Press, Ames, Iowa, 1970, Chapter II, p 167-182. 6 fig, 1 tab, 62 ref.

Descriptors: *Insecticides, *DDT, *Aldrin, Dieldrin, Insects, Carbamate pesticides, Insect control, Metabolism, Organophosphorus pesticides, Chlorinated hydrocarbon pesticides, Pesticide toxicity, Pesticide residues.
Identifiers: Toxaphene, Parathion, Malathion, Carbaryl, Metabolites, Arthropods.

Insecticides occur in the environment because of purposive applications for pest control and because of accidents and carelessness. The major problems with insecticides arise from the contamination of the environment and food and the development of resistant arthropod-pest populations. The persistence of insecticides in the atmosphere, water, soil, plants, animals, and microorganisms is being investigated. Alterations of insecticides occur under both metabolic and nonmetabolic conditions. Knowledge of the metabolism of insecticides is prerequisite to their development and use for insect control. Identification and toxicological assessment of the metabolic products should precede establishment of residue and other safety factors. More basically, metabolism studies of insecticides reveal intoxication and detoxication processes and how these relate to physiological effects and problems of resistance. With some insecticides, primary metabolic attack may form compounds whose toxicity approximately equals or is greater than the parent insecticide. Numerous nonmetabolic factors exert effects on the structure and persistence of insecticides. The solubilities of insecticides in soil and water are especially important in relation to their movement and persistence in the environment. (See also W71-05437) (White-Iowa State)
W71-06438

EFFECTS OF AGRICULTURAL POLLUTION ON EUTROPHICATION,
Wisconsin Univ., Madison. Dept. of Sanitary Engineering, and Wisconsin Univ., Madison. Dept. of Water Chemistry.
D. E. Armstrong, and G. A. Rohlich.
Agricultural Practices and Water Quality, Iowa State University Press, Ames, Iowa, 1970, Chapter 23, p 314-330. 14 tab, 2 fig, 26 ref.

Descriptors: *Eutrophication, *Nitrogen, *Phosphorus, Nutrients, Algae, Nitrates, Surface runoff, Base flow, Percolation, Leaching, Drainage, Farm wastes, Soil management, groundwater, Wisconsin, Water supply.
Identifiers: *Agricultural drainage, Lake metabolism, Mobility, Particulate form, Feedlots, Nutrient sources.

The paper discusses nitrogen and phosphorus transport in agricultural drainage since these are the most important nturients involved in eutrophication. It is generally expected that inorganic nitrogen is transported mainly as nitrate by percolating water, although the amounts of ammonium and nitrate carried in runoff waters may be highly significant in terms of the receiving water. Similarly, the largest amount of phosphorus is likely transported in particulate form in runoff waters, but the amount of dissolved phosphorus in runoff water may be of equal or greater importance even though lower in quantity. The contribution of agricultural drainage to the nitrogen and phosphorus status of waters is next examined. The data presented suggest that agricultural land is an important contributor of nitrogen and phosphorus to water. About 60% of the nitrogen and 42% of the phosphorus were estimated to come from agricultural land. Nutrient budget estimations were based on data obtained on a small scale and extrapolated and thus have a low reliability. Nutrient sources are numerous and generalizations as to which source is the most important cannot be made. The contribution of agriculture should be reduced by improved and more efficient agricultural management practices. (See also W71-05437) (White-Iowa State)
W71-06443

EFFECTS OF AGRICULTURAL POLLUTANTS ON RECREATIONAL USES OF SURFACE WATERS,
Missouri Univ., Columbia. Dept. of Zoology; and Missouri Dept. of Conservation, Columbia.
Robert S. Campbell, and James R. Whitley.
Agricultural Practices and Water Quality, Iowa State University Press, Ames, Iowa, 1970, Chapter 24, p 331-343. 3 tab, 1 fig, 43 ref.

Descriptors: *Pollutants, *Recreation, Lakes, Streams, Algae, Pesticides, DDT, Return flow, Sediments, Soil erosion, Fertilizers, Farm wastes, Fish, Fish eggs, Turbidity, Nutrients, Dissolved oxygen, Nitrogen, Phosphorus, Water Quality Act, Water quality.

Unquestionably many agricultural pollutants affect recreation through alteration of water quality and degradation of fish and aquatic life. The more serious polluting agents are eroded soil, agricultural fertilizers, animal wastes, and pesticides. While the problems relating to agricultural pollution are complex, and the solutions will not easily be attained, it seems reasonable that in many instances alternative procedures can be developed. Pollution control measures are available which will allow continuation of agricultural production and enhance and protect water quality and recreation. While these procedures may be costly to apply, the expenditure should be judged in light of its contribution toward the preservation of man's environment. Especially in the instance of pesticide use, protection of water quality may be requisite to protection of the health of man from unknown long-term effects of pesticides. Reduction and control of agricultural pollutants are essential to develop and maintain a high quality environment. Quality of life and quality of environment are synonymous. (See also W71-05437) (White-Iowa State)
W71-06444

EFFECT OF SOIL TEMPERATURE ON THE AVAILABILITY OF PHOSPHORUS IN ANIMAL MANURES,
California Univ., Davis.
J. L. Abbott, and J. C. Lingle.
Soil Science, Vol 105, No 3, p 145-152, 1968. 3 tab, 5 fig, 14 ref.

Descriptors: *Farm wastes, *Phosphorus, Water pollution effects, Nutrients, Organic matter, Nitrogen, Carbon dioxide, Soil temperature, Plant growth.
Identifiers: *Animal manure, Available phosphorus, Plant response.

Steer, dairy, sheep, and poultry manures, and alfalfa supplemented with monocalcium phosphate added to two slightly acid soils at the rate of 50 ppm. total P and supplied plant-available P to two successive crops - turnips and tomatoes. Dry-weight yield and total P in the tissues provided data for evaluating plant-available P in the manures. In the Sierra sandy loam at the medium soil temperature, uptake of P by turnips was greater from the sheep, poultry, and alfalfa plus PO4 treatments than from the dairy manure treatment. In the Gridley clay loam at 15 deg C. soil temperature, uptake of P by turnips was greater from the poultry manure treatment than from the other treatments. Soil temperature had no measurable effect on the availability of manurial P to tomatoes. At all soil temperatures, P-solubilizing processes, including mineralization of the organic P in both soils and amendments, appeared to contribute to the P absorbed by plants. These processes appeared to continue during the second cropping period, notably at the low (20 deg C.) soil temperature, after having been previously cropped for 5 weeks and incubated for 3 weeks at 15 deg C. Manures yielded more available P in the Sierra than in the Gridley soil. From these data, the HOAc-soluble:nonsoluble P ratios of manures could not be said to have influenced the availability of manurial P to plants. On an equal dry-weight basis, the overall effectiveness of manures in supplying available P depended on their respective total P contents: poultrySsheepSsteer — dairy. (Christenbury-Iowa State)
W71-06455

5D. Waste Treatment Processes

RECOVERY OF URANIUM FROM NATURAL MINE WATERS BY COUNTERCURRENT ION EXCHANGE,
Bureau of Mines, Salt Lake City, Utah. Salt Lake City Metallurgy Research Center.
J. R. Ross, and D. R. George.
Bureau of Mines Report of Investigations RI-7471, January 1971. 17 p, 11 fig, 1 tab.

Descriptors: *Ion exchange, *Uranium radioisotopes, *Leaching, *Mine water, *Mine drainage, Mine wastes, Separation techniques, Resins, New Mexico, Waste water treatment.
Identifiers: *Uranium recovery.

Recovery of uranium from slightly alkaline mine water, available in the Ambrosia Lake district of New Mexico, was studied using countercurrent ion exchange columns. Approximately 5 million gallons of mine water containing 9 to 12 ppm U was treated by ion exchange. Uranium recoveries averaged in excess of 98 percent at solution flows ranging from 15 to 25 gallons per square foot per minute and resin loadings up to 3.6 pounds to U per cubic foot. Loaded resin was continuously eluted in a countercurrent elution column with a diameter of 4 inches and containing a bed of resin 9 feet deep. The resin was eluted to a residual loading of less than 0.06 pound of U per cubic foot, at a resin-retention time of 224 minutes, using only 1.9 volumes of 1.1 M NaCHO3 solution per volume of resin. Compared with existing ion exchange practices for recovering uranium from mine waters in the Ambrosia Lake district of New Mexico, use of these improved ion exchange contactors would reduce ion exchange resin requirements at least 70 percent. (Knapp-USGS)

W71-05841

NORTH SIDE TREATMENT PLANT CHLORINATION,
Metropolitan Sanitary District of Greater Chicago, Ill. Dept. of Research and Control.
Jeanne Johnson.
Metropolitan Sanitary District of Greater Chicago, Dec 20, 1968. 20 p, 7 fig, 2 tab, 3 ref.

Descriptors: *Chlorination, *Waste water, *Sewage effluents, *Waste water treatment, *Sewage treatment, Water pollution treatment, Bacteria, Scum, Coliforms, Illinois.
Identifiers: *Chicago (Illinois), *Chlorine dosage.

The report summarizes field observations and tests of the results of chlorination at the District's North Side Treatment Plant, made in 1968. The results of using the North Shore Channel as a partial contact chamber are discussed including the method of using an interpolated count in lieu of an actual count at the 30 minute contact point. Correlations between chlorine dosages, chlorine residuals and bacterial densities are presented, and the most practical and effective dosage as well as how the meeting of SWB-15 requirements should be evaluated is suggested. It was concluded that if the North Shore Channel is to be used as a partial contact chamber, it is valid to interpolate a bacterial count for the 30 minute point only when no stormwater is being discharged in the sampling area, and when sufficient replicate samples are taken to arrive at a meaningful average bacterial density. It was found to be more practical to use a single chlorine dosage based on plant flow, as is presently practiced at the Northside Plant, rather than chlorine residual control. The dosage found to meet SWB-15 requirements at the outfall 100% of the time sampled was 1.25 p.p.m. The next lowest dosage used, 1.00 p.p.m., did not meet requirements 100% of the time even with the contact time extended to 30 minutes. The scum condition on the North Shore Channel experienced during chlorination appears to be caused by grease coming from the plant. (Poertner)
W71-05925

PHOSPHATE REMOVAL FORM TERTIARY EFFLUENT WITH ION EXCHANGE MATERIALS,
Metropolitan Sanitary District of Greater Chicago, Ill.
Howard Stethers.
Metropolitan Sanitary District of Greater Chicago, January 22, 1968. 26 p, 15 fig, 1 tab.

Descriptors: *Phosphates, *Phosphorus, *Ion exchange, *Tertiary treatment, *Waste water treatment, Pilot plants, Demineralization, Water chemistry, Anion exchange, Water quality, Water quality control, Water purification, Water pollution treatment, Laboratory tests, Illinois.
Identifiers: *Activated alumina, *Anion exchange resins.

The tertiary treatment facilities at the District's Hanover Plant are expected to yield an effluent high in phosphate and low in nitrogen content. Chemical methods were studied for removing the phosphates without increasing the content of other anions to determine the better methods for bench scale testing. The ion exchange process was the only one investigated on a bench scale because the process costs and technology of this method offered an acceptable solution to the removal of phosphates from the effluent. The most important result obtained in these experiments was to show that activated alumina selectively removes phosphates from solutions that contain phosphates, sulfates and chlorides. The following conclusions were drawn from the study: (1) either anion exchange resins or activated alumina may be used to remove phosphates from the effluent; (2) the best anion resin was that supplied by Illnois Water Treatment Company under the designation A-324-C; (3) the best activated alumina was the chromatographic grades; however, the cost will eliminate these materials for production use; (4) activated alumina pellets gave very acceptable results and do not appear to be too expensive; (5) activated alumina chips give a good removal rate for phosphate and are the cheapest material tested. The investigator recommended that an automatically operated pilot plant having an ion exchange column of about 15,000 gal./day capacity be built to study recycle times and the resistance of activated alumina particles to size degradation. (Poertner)
W71-05926

FE CL3 ADDITION EXPERIMENTS FOR IMPROVED EFFLUENT QUALITY AT THE CALUMET TREATMENT PLANT, INTERIM REPORT,
Metropolitan Sanitary District of Greater Chicago, Ill. Research and Development Lab.
Clark L. Weddle, and George R. Richardson.
Metropolitan Sanitary District of Greater Chicago, May 9, 1969. 41 p, 14 fig.

Descriptors: *Sewage effluents, *Waste water, *Sewage treatment, *Waste water treatment, *Flocculation, *Coagulation, Settling velocity, Sedimentation rates, Suspension, Chemical precipitation, Bacteria, Water pollution treatment, Illinois.
Identifiers: *Ferric chloride, Organic polymer, Coagulation aids, Calumet (Illinois).

The Calumet Research Project was started as a result of an unsatisfactory effluent quality observed during the end of December, 1968, and January and February, 1969. Microscopic examination of the solid material in the effluent revealed that this material was small, highly dispersed, bacterial floc which settled very poorly. It was therefore proposed that the addition of a coagulant, such as FeCl3, and/or a coagulant aid, such as an organic polymer, may enhance the formation of larger floc particles resulting in better solids separation in the final clarifier and an improved effluent quality. To determine the effectiveness of these chemical additions, a series of laboratory investigations were conducted which indicated that additions of FeCl3 and Hercufloc 814 organic polymer would reduce the effluent suspended solids concentration. As a result of these laboratory experiments, an experimental program was established along with necessary plant modifications and plant operation to ascertain the effectiveness of these chemicals on a plant scale basis. The report presents the results of the experiments conducted on the addition FeCl3 to one half of one battery at the Calumet Plant. (Poertner)
W71-05927

FIELD INVESTIGATION OF ENVIRONMENTAL EFFECTS OF COOLING TOWERS FOR LARGE STEAM ELECTRIC PLANTS,
Portland General Electric Co., Oreg. Dept. of Engineering Design.
D. J. Broehl.
April 1, 1968. 28 p.

Descriptors: *Cooling towers, *Fog, *Mist, *Nuclear powerplants, *Environmental effects, *Cooling water, Water vapor, Meteoric water, Environmental engineering, Artificial precipitation, Condensation, Thermal powerplants, Heated water, Heat exchangers.
Identifiers: *Cooling tower effects, *Hyperbolic cooling towers, Steam-electric plants, Heat disposal.

The Portland General Electric Company made field inspections of steam-electric generating plants located in the coal mining region of the Appalachian Mountains. The purpose was to observe possible fogging, misting or icing produced by the operation of cooling towers at these plants. This information was to be used by the company in designing the cooling towers for its Trojan nuclear plant. Four of the plants visited use natural draft hyperbolic cooling towers. They range in height between 325 to 400 feet, and in base diameter from 180 to 400 feet. These towers have a total of 6 1/2 years of operating time in climates having more extreme variations than the Trojan plant site. Vapor plumes from the large natural draft towers do not produce ground level fog, even under the most adverse weather conditions. Plume lengths were found to be less than 400 feet most of the time. Induced draft cooling towers were also found satisfactory for the Trojan plant; however, there is a possibility of substantial ground-level fog within a quarter-mile of the towers. It was estimated that the cooling towers for the Trojan plant will cost between 9 and 12 million dollars and that towers will provide a satisfactory means of heat disposal. (Poertner)
W71-05930

PROBLEMS IN DISPOSAL OF WAST HEAT FROM STEAM-ELECTRIC PLANTS.
Federal Power Commission, Washington, D.C. Bureau of Power.
For primary bibliographic entry see Field 08A.
W71-05931

FACTORS IN WASTE HEAT DISPOSAL ASSOCIATED WITH POWER GENERATION,
Federal Power Commission, Washington, D.C.
For primary bibliographic entry see Field 08A.
W71-05932

DETERMINATION OF THE BIODEGRADABILITY OF ANIONIC SYNTHETIC SURFACE ACTIVE AGENTS.
Organisation for Economic Co-Operation and Development, Paris (France).

Organisation for Economic Co-Operation and Development, Paris, No 78.728, 1970. 30 p, 4 fig, 1 append.

Descriptors: *Detergents, *Biodegradation, *Test procedures, Sewage treatment, Biological treatment, Model studies, Activated sludge, Water pollution sources, Surfactants.
Identifiers: Methylene blue active substances, International test procedures, Detergent industry, Surface active agents.

This report proposes a system of analyses that could predict the biodegradability of anionic surface active agents under conditions of biological sewage treatments. The system comprises two stages: a screening or a static test of the 'open flask' type, based on degradation of methylene blue active substance (MBAS); a confirmatory test simulating biological treatment of sewage in a small version of an activated sludge plant. The latter procedure involves daily determinations of the MBAS concentration in the effluent, the results being expressed in per cent as arithmetic averages for 21 days or for a longer period not exceeding 6 weeks. The proposed system was subjected to trials in 29 laboratories of 13 countries. (Wilde-Wisconsin)
W71-05990

ECOLOGY OF SELECTED BACTERIA IN A SMALL INTERMITTENT SEWAGE POND,
Utah State Univ., Logan. Dept. of Bacteriology.
F. J. Post.
Water Research, Vol 4, p 341-351, 1970. 6 fig, 6 tab, 13 ref.

Descriptors: *Coliforms, *Bacteria, *Oxidation lagoons, Viruses, Pathogenic bacteria, Utah, Waste water treatment, Ecology, Sewage treatment, Analysis, Enteric bacteria, Regression analysis.
Identifiers: Fecal indicators, Logan (Utah), Escherichia coli, Oscillatoria, Beggiatoa, Sphaerotilus natans.

A 24-hour retention sewage oxidation pond in Logan, Utah, had been studied to determine whether a relationship exists between population levels of certain bacteria and selected physical fac-

rs of the environment. When the pond was first filled a biological mat developed predominantly of Oscillatoria type accompanied by Beggiatoa type with sulfur inclusions. A close parallel was found between outlet water temperature and certain groups of special fecal indicators. Fecal enterococci (as measured by the KF method) proved to be the most sensitive to environmental conditions with a correlation coefficient to temperature cubed of -0.857. Fecal Escherichia coli were also highly sensitive with a correlation coefficient of -0.752, the latter most sensitive of the coliform group as a whole (-.608). Bacterial antagonism as well as algal activity may be significant; other possibilities include bacteriophage, protozoa, and invertebrate foragers. The total count at 20C appears to be an insensitive indicator of pond activity as it only reflects numerical levels of decomposing bacteria. Knowledge of the casual nature of these changes may benefit the design of oxidation ponds and understanding the role of bacteria in transformation of organic matter. (Jones-Wisconsin)
W71-05995

TREATMENT OF FISH HATCHERY EFFLUENT FOR RECYCLE,
New Mexico State Univ., University Park. Dept. of Civil Engineering.
R. P. Gigger, Jr., and R. E. Speece.
Available from NTIS as PB-198 088, $3.00 in paper copy, $0.95 in microfiche. Technical Report Number 67, Engineering Experiment Station, November 1970. 119 p, 25 tab, 26 fig, 23 ref. OWRR Project A-018-N MEX (3).

Descriptors: *Fish hatcheries, *Ammonia, *Filtration, Turbidity, Nitrogen, Biochemical oxygen demand, Aeration, Filters, New Mexico, Waste water treatment.
Identifiers: *Recycle, Nitrifying bacterial filters, Alchesay National Fish Hatchery (N Mex).

The removal of ammonia from fish hatchery effluents using nitrifying bacterial filters was demonstrated in pilot plant experiments. The filters used in this study showed maximum ammonia removal rates of from 150-200 milligrams of ammonia-nitrogen per hour per cubic foot of filter and the ammonia removal rates in the filters increased slightly as flow rates increased. This experiment also showed the effect of water recycle on water quality and the feasibility of using a 100% recycle system on a large scale at Alchesay National Fish Hatchery during period when the regular water source is unsuitable for use due to high turbidity levels. Higher recycle rates caused lower ammonia concentrations under equilibrium conditions and the additional effects of filtration included removal of turbidity and a considerable consumption of oxygen in the reduction of carbonaceous BOD. The qualitative behavior of rainbow trout subjected to recycle conditions was observed and it was concluded that when filter size and aeration were adequate, fish hatchery effluent could be treated in nitrifying bacterial filters and recycled without any adverse effects on these fish. Mechanical difficulties prevented satisfactory operation of the large scale recycle experiment. (Ellis-Texas)
W71-06024

STUDY AND EXPERIMENTS IN WASTE WATER RECLAMATION BY REVERSE OSMOSIS,
Gulf General Atomic Inc., San Diego, Calif.
I. Nusbaum, J. H. Sleigh, Jr., and S. S. Kremen.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC. 20402, Price $1.25. SOD order no 167.13/4:17040.05/10. Available from NTIS as PB-198 092, $3.00 in paper copy, $0.95 in microfiche. Water Pollution Control Research Series, 17040-05/70, May 1970. 116 p, 8 tab, 48 fig, 5 ref, append. FWQA Program 17040-05/70.

Descriptors: *Reverse osmosis, *Brine, *Membranes, Activated sludge, Activated carbon, Separation techniques, Acidity, Fouling, Chlorine, Chemical oxygen demand, Waste water treatment, Chemical precipitation, Osmosis, Mebrane processes, Demineralization.
Identifiers: *Flux, Modules, Spacers.

Current reverse osmosis technology was applied to the treatment and demineralization of secondary effluents to determine what operational problems may occur, and develop methods of alleviating them. Two parallel reverse osmosis systems, with 50 ft sq spiral-wound reverse osmosis modules, were operated and results for activated sludge effluent versus activated carbon treated activated sludge effluent were compared. Fouling problems were encountered for which previously developed cleaning techniques were ineffective. An enxyme-based detergent technique was developed which alleviated the problem and restored performance. The size of the brine spacers affected only the pressure drop across the modules, and not the overall performance. Also the quantity of water handled would, over a 3 year period, be substantially more than could be handled by standard flux-high selectivity membranes. (Lowry-Texas)
W71-06025

PROCESS MODELING OF BIOLOGICAL WASTE TREATMENT,
Texas Univ., Austin.
D. M. Himmelblau, and E. F. Gloyna.
Available from NTIS as AD-715 726, $3.00 in paper copy, $0.95 in microfiche. Annual Progress Report no 2, October 10, 1970. 14 p.

Descriptors: *Mathematical models, Aerobic treatment, Biomass, Aeration, Tracer, Waste water treatment.
Identifiers: *Population balance techniques, *Mean residence time, *Complete mixing, Pulse injection, Concentration, Sodium-24, Variance, Agitation, Laboratory scale.

Laboratory scale aeration units have been employed to obtain and identify mathematical models of biological waste treatment. Sodium-24 was used as a tracer material since it doesn't affect the physical parameters of the fluid, it doesn't undergo any chemical reactions, and it is easily detectable in small concentrations. Data obtained is highly reproducible if periods of at least 8-10 residence times are used. However, the assumption of complete mixing was found to be applicable only in certain cases. When there wasn't complete mixing, results were not reproducible. (Lowry-Texas)
W71-06026

PORT ELGIN'S OXIDATION DITCH,
Mackay (A.M.) and Associates, Owen Sound (Ontario).
A. M. Mackay.
Water and Pollution Control, Vol 108, No 12, p 32-33, December 1970.

Descriptors: *Biodegradation, Waste water treatment, Rotors, Sludge, Chlorination, Activated sludge, Biochemical oxygen demand, Oxidation, *Oxidation lagoons.
Identifiers: Oxidation ditch, *Resort area, Extended aeration, Contact stabilization, Suspended solids, Ontario, Canada.

Port Elgin, Ontario, Canada, is a resort town with a population which fluctuates from 6,000 in the summer to 1,800 in the winter. When replacement of their waste treatment facilities became imperative, several alternatives, including conventional activated sludge and extended aeration, were investigated. The oxidation ditch plan was chosen. The final treatment system consists of one long and one short ditch, both agitated by large rotors. The long ditch is where most of the work is done, and the small ditch is for reaeration and storage of solids to be returned as needed. The system was built at a total cost of $420,000 and was designed for 8,000 people at a hydraulic loading of 1 MGD. So far, the effluent discharge from the plant has 2.5 mg/l of BOD and less than 7 mg/l of suspended solids. There has been no odor problem. Power cost and maintenance were $200 per month but are expected to rise to $270 per month, with total operational cost including chlorine then being $560 per month. (Lowry-Texas)
W71-06027

FILAMENTOUS MICROORGANISMS AND THE BULKING OF ACTIVATED SLUDGE,
Rutgers-the State Univ., New Brunswick, N.J. Dept. of Environmental Sciences.
M. S. Finstein, and H. Heukelekian.
Proceedings, Industrial Waste Conference, 20th, May 4, 5, 6, 1965, Purdue University, Vol XLIX, No 4, p 175-181, July 1965. 4 fig, 1 tab, 8 ref.

Descriptors: *Microorganisms, *Activated sludge, Waste water treatment, Microbiology.
Identifiers: *Bulking, Sludge volume index.

Quantitative data with which to assess the influence of filamentous microorganisms on the settleability of activated sludges is presented. Flocs from 4 activated sludge plants were characterized with respect to their diameters and total length of associated filamentous microorganisms per floc. Flocs ranged from 0.02-0.2 mm in diameter and 0.0-2.0 mm in length. No consistent relationship was found between floc diameter and SVI but the more filamentous samples invariably had a higher SVI. (Ellis-Texas)
W71-06028

SHEARING EFFECTS ON SETTLING OF ACTIVATED SLUDGE,
California Univ., Davis.
Richard A. Bradley, and Ray B. Krone.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 97, No SA1, p 59-79, February 1971. 9 fig, 1 tab, 24 ref.

Descriptors: *Activated sludge, *Shear, Coagulation, Colloids, Flocculation, Suspensions, Settling velocity, Sedimentation, Waste water treatment.
Identifiers: *Agglomeration, Velocity gradient, Break-up.

Degree of shear in a settling basin was investigated as to its effect on settling of activated sludge. The two main effects of shear are the aggregation of sludge particles and the break-up of such aggregates, and experiments were performed on both conditions. Attempts were made to hold all variables on other than the settling properties and the shear rate constant to preclude changes either in the viscosity or the physical state. All tests were conducted in a bench scale apparatus of approximately 3.0 l capacity. Optimum shearing rate for the activated sludge studied was determined to be 15 per sec, and this amount of shear significantly enhanced the aggregation of activated sludge particles, and their separation by settling from the suspending water. (Lowry-Texas)
W71-06029

FUNDAMENTAL ASPECTS OF SURFACE AERATOR PERFORMANCE AND DESIGN,
Mixing Equipment Co., Rochester, N.Y.
J. R. McWhirter.
Proceedings, Industrial Waste Conference, 20th, May 4, 5, 6, 1965, Purdue University, Vol XLIX, No 4, p 75-92, July 1965. 10 fig, 24 ref.

Descriptors: *Aeration, *Oxygen, Oxygenation, Waste water treatment, Mass transfer, Reaeration, Oxidation, Activated sludge.
Identifiers: *Surface aerators.

A comparison of unsteady-state aeration of pure tap water, steady-state aeration of pure tap water, steady-state oxidation of sulfite solution, and steady-state aeration of activated sludge was made to evaluate surface aeration equipment. In testing surface aerators, it is extremely difficult to prevent a concentration gradient from developing in the liquid at the start of the reaeration which causes a

low calculation of the mass transfer coefficient. Proper interpretation of sulphite oxidation data can only be made by taking into account the effect of the rapid sulphite-oxygen uptake on the overall mass transfer rate. Sulphite oxidation data show higher oxygen uptake rates than corresponding steady-state reaeration data in addition to showing a different temperature variation and a significant variation in oxygen uptake rates with different catalysts. The unsteady-state reaeration technique is the most widely used and accepted method of determining the mass transfer coefficients or oxygenation capacity of aeration devices. (Ellis-Texas)
W71-06030

MOISTURE TRANSPORT IN SLUDGE DEWATERING AND DRYING ON SAND BEDS,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
Hsi Tang Ning, K. B. Schnelle, Jr., and F. L. Parker.
Technical Report No 18, 1969. 198 p, 19 tab, 68 fig, 20 ref, 4 append. FWQA Program 17070 DIV.

Descriptors: *Moisture content, *Sludge, *Dewatering, Gamma rays, Attenuation, Sludge disposal, Waste water treatment, Chemical precipitation.
Identifiers: *Sand beds.

The specific aim of this study is as follows: (1) to determine the moisture content in the sludge layer as well as in the sand layer by the gamma-ray attenuation technique; (2) determine the drainage characteristics of sludge having various initial depths; (3) determine the effects of evaporation from the sludge surface on the drainage process of the sludge; (4) to study the moisture transport phenomenon both in the sludge cake and in the sand beds under various conditions; and (5) to study the effect of sludge with chemical conditioners on the dewatering rate on sand beds. The gamma-ray attenuation technique can be used to determine the moisture content of the sand layers but determination of sludge moisture leaves much to be desired. The weight difference method was shown to be an acceptable way to measure the average moisture content of the sludge. It was shown that the time required to complete the drainage flow of the sludge is a function of the initial sludge depth and the evaporation date and depth of the sand have little effect on the drainage process. The moisture in the sand layer is contained in the bottom 4-5 cm of the sand bed. Chemically conditioned sludges are dewatered considerably faster than are those not chemically conditioned. (Ellis-Texas)
W71-06031

PROCESS OPTIMA IN ACTIVATED SLUDGE,
Illinois Inst. of Tech., Chicago.
S. Polocsik, R. B. Grieves, and W. O. Pipes, Jr.
Proceedings, Industrial Waste Conference, 20th, May 4, 5, 6, 1965, Purdue University, Vol XLIX, No 4, p 197-209, July 1965. 5 fig, 1 tab, 4 ref. Public Health Service Training Grant no 5T1ES26-02.

Descriptors: *Activated sludge, *Baffles, *Aeration, Kinetics, Nutrients, Optimization, Waste water treatment.

An effort has been made to analyze the effects upon the activated sludge process of first, baffling the aeration tank to provide three completely-mixed compartments of varying fractional volumes; second, of varying the input distribution of the waste to the three compartments, and third, of varying the recycle flow to the three compartments. Two-phase and one-phase kinetics were employed, with the latter utilized for the case of no sludge recycle. Optimum operation is achieved by dividing the aeration tank volume by baffling into three equal-size compartments. It is best to distribute the feed toward the front of the system while the recycle should be inserted toward the back end of the system. (Ellis-Texas)
W71-06032

EVALUATION OF SOME STABILIZATION PONDS IN INDIA,
Central Public Health Engineering Research Inst., Nagpur (India).
R. H. Siddiqi, and B. K. Handa.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 97, No SA1, p 91-100, February 1971. 7 fig, 1 tab, 11 ref.

Descriptors: *Oxidation lagoons, *Aerobic treatment, *Anaerobic conditions, Ponds, Climatic zones, Temperature, Turbulence, Oxygenation, Algae, Photosynthesis, Municipal wastes, Biochemical oxygen demand, Waste water treatment, Microorganisms.
Identifiers: Facultative microorganisms, India.

Climatic conditions in India are favorable to the operation of engineered waste stabilization ponds. Consequently, the treatment of wastes in such ponds is economically competitive with conventional biological treatment. Data collected from several installations in India were analyzed to determine what useful parameters of operation could be identified. Pond loading was found to be best expressed by a load factor, L sub f, which is the ratio of BOD load to algal produced oxygen. For L sub f between .44 and 8.0, the performance was determined from the following equation: E — 100 over (1 .. 0.188 L sub f or explanential to 0.48). From the preceding investigations, it was determined that the majority of organic matter destroyed is destroyed anaerobically. Therefore, ponds of depth greater than 5 feet are more efficient in their operation since there is less turbulence and less change of the anaerobes being exposed to oxygen. It was also determined that single cell reactors, or the first cell of a multi-cell arrangement maintain a higher destruction rate constant, with the rate of BOD reduction being described as a first order equation. The rate drops off with each successive cell in a multi-cell arrangement. (Lowry-Texas)
W71-06033

SOME EFFECTS OF HIGH SALT CONCENTRATIONS ON ACTIVATED SLUDGE,
Oklahoma State Univ., Stillwater. Bioengineering Labs.
D. F. Kincannon, and A. F. Gaudy, Jr.
Proceedings, Industrial Waste Conference, 20th, May 4, 5, 6, 1965, Purdue University, Vol XLIX, No 4, p 316-328, July 1965. 8 fig, 1 tab, 14 ref.

Descriptors: *Salts, *Activated sludge, Sodium chloride, Waste water treatment, Synthesis, Sludge.
Identifiers: Lysis, Substrate, Shock loading.

In previous experiments it was found that high salt concentrations could cause a severe decrease in the substrate removal rate and that long-term exposure to high salt concentrations caused a significant change in the ratio of respiration to synthesis. In the present study, experiments were designed to gain insight into the causal effects uncovered in the previous investigation, particularly with respect to shock-loading. For sludges developed in fresh water the substrate removal rate decreases at slug doses of 30,000 mg/l Na Cl but does not cause serious distress to the system. However, for mixed liquor concentrations of 45,000 mg/l there is severe impairment of substrate removal efficiency. Sludges grown in high salt concentrations were characterized by low carbohydrate and protein content, and abnormally high lipid and RNA content. When sludges which are acclimated to a high concentration of salt are placed in a fresh water environment, the immediate response involves a release of cellular components indicative of lysis. (Ellis-Texas)
W71-06034

PRELIMINARY PROCESS DESIGN AND TREATABILITY STUDIES OF FISH PROCESSING WASTES,
Quirk, Lawler, and Matusky Engineers. New York.
F. E. Matusky, J. P. Lawler, T. P. Quirk, and E. J. Genetelli.
Proceedings, Industrial Waste Conference, 20
May 4, 5, 6, 1965, Engineering Bulletin of Purd
University, Vol XLIX, No 4, p 60-74, July 196
fig, 9 tab, 3 ref.

Descriptors: *Fish handling facilities, *Fi
*Potatoes, Municipal wastes, Waste water tre
ment, Digestion, Dewatering, Gases.
Identifiers: Volatile solids.

A combined study of an existing fish plant
treatability of a synthetic waste were used to for
rational approach to the process design for a jo
plant for the treatment of wastes from dome
sewage and fish and chip processing. Determi
tion of waste characteristics, an analysis of tre
ment unit operations and cost estimates were ma
to determine the unknowns and the effect of
proposed processing operations on the joint tre
ment system. Laboratory studies on digestion
dewatering were made on a waste-simulat
sludge to determine the optimum digester load
for a combined fish, potato, and municipal was
(Ellis-Texas)
W71-06035

TREATMENT OF ORGANIC INDUSTRIA WASTES BY LAGOONING,
California Univ., Berkeley. School of Pub
Health.
R. C. Cooper, W. J. Oswald, and J. C. Bronson.
Proceedings Industrial Waste Conference, 20
May 4, 5, 6, 1965, Purdue University, Vol XLI
No 4, July 1965, p 351-364. 6 fig, 2 tab, 8 ref.

Descriptors: *Industrial wastes, *Aerobic con
tions, *Anaerobic conditions, Oil, Lagoons, Was
water treatment, *Oxidation lagoons.
Identifiers: Facultative conditions, Rendering.

A brief description of anaerobic facultative, a
aerobic ponds is presented as a possible means
treatment of most industrial wastes. Oxidati
ponds were observed and studied at an anima
rendering plant, a hide curing plant, a petroleu
plant, and a chicken farm. From these observatio
it was apparent that lagooning was successful
treating wastes from these industries. Suggestio
for designing lagoons, pilot plants, and seeding a
presented. (Ellis-Texas)
W71-06036

TWENTY YEARS OF INDUSTRIAL WAST TREATMENT,
Purdue Univ., Lafayette, Ind.
D. E. Bloodgood.
Proceedings Industrial Waste Conference, 20th
May 4, 5, 6, 1965, Purdue University, Vol XLI
No 4, July 1965, p 182-188.

Descriptors: *Industrial wastes, *Waste wate
treatment, Dairy industry, Canneries, Oil waste
Pulp and paper industry, Coal mine wastes, Aci
water, *Waste treatment.
Identifiers: Packinghouse wastes, Metal platin
Brewing.

There has been an increase in the attention given to
the general subject of water pollution and its abate
ment but there is not adequate information availa
ble on the successful operation of plant scal
disposal or recovery operations. Although industry
has made great strides in changing its physical en
vironment (processes, use of by-products, an
waste treatment processes) it has failed to keep
others informed of its progress in meeting the cha
lenges of waste treatment. (Ellis-Texas)
W71-06037

BIOLOGICAL CONCEPTS AND INDUSTRIAL WASTE DISPOSAL PROBLEMS,
Academy of Natural Sciences of Philadelphia, Pa.
J. Cairns, Jr.
Proceedings Industrial Waste Conference, 20th,
May 4, 5, 6, 1965, Purdue University, Vol XLIX,
No 4, July 1965, p 49-59, 5 fig, 5 ref.

Descriptors: *Microbiology, *Microorganisms, *Bioassay, Environmental effects, Biota, Aquatic environment, *Industrial wastes, *Waste disposal, Waste water treatment.
Identifiers: Biological monitoring.

A discussion is conducted demonstrating that biological data is as easily assessed as chemical data, that biological data may be presented numerically, and that existing biological concepts could furnish information not now provided by any other system of pollution detection. The three basic needs of any waste disposal design system include: (1) a baseline reference study showing the existing preoperation conditions; (2) a continually operative monitoring system to check short-term effects caused by spills, changes in operating procedures, etc; and (3) a predictive system whereby the effects of a waste might be measured before introducing the waste into the stream itself. (Ellis-Texas)
W71-06038

DEVELOPMENT OF DESIGN PARAMETERS FOR INTERSTATE REST AREA SEWAGE TREATMENT SYSTEMS,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
Leslie B. Stuart.
Master of Science Thesis, Engineering Research Series, August 1970. 90 p, 17 tab, 12 fig, 22 ref, 2 append.

Descriptors: *Sewage treatment, *Waste water treatment, *Aeration, Tennessee, Treatment facilities, *Highways, Organic loading.
Identifiers: *Interstate highway system, Rest areas, Package treatment plants, *Extended aeration, Hydraulic loading.

A research project was conducted to establish design parameters for application to Interstate Rest Area sewage treatment facilities. This study was conducted at the Smith County Rest Area, located on I-40, Tennessee where the sewage treatment system consists of a 20,000 gpd package-type extended aeration plant installed in February 1969 on recommendation of private consultants. The investigation indicates that current design of Interstate Rest Area sewage treatment systems in Tennessee is much too conservative and uneconomical. The results of this study indicate that hydraulic loading is the critical factor in sizing package-type treatment facilities for Interstate Rest Areas. The Smith County plant was designed on the basis of 10.68 gallons per vehicle (gpv) but tests showed that the actual flow is only 5.52 gpv and the organic loading is only 200 mg/l while it was designed for 240 mg/l. (Ellis-Texas)
W71-06040

A STUDY OF MUNICIPAL WASTE WATER RECLAMATION,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
William B. Willard, Jr.
Master of Science Thesis, August 1970. 202 p, 15 tab, 70 fig, 51 ref, 10 append.

Descriptors: *Municipal water, *Municipal wastes, *Water reuse, Waste water treatment, Water treatment, Chemical oxygen demand, Turbidity, Tertiary treatment, Tennessee.
Identifiers: Total suspended solids, Cookeville (Tenn).

Research was conducted to determine the feasibility of municipal waste water reclamation by recycling a city's sewage treatment plant effluent through its water treatment plant. A continuous flow, 3.5 gallon/hour model water treatment plant was designed and constructed using common chemical-physical treatment processes such as screening, chemical coagulation, sedimentation, filtration, and chlorination. Samples of the effluent from the Cookeville, Tennessee, Sewage Treatment Plant were passed through the model and analyzed for turbidity, total suspended matter and chemical oxygen demand. A comparison of analyses of samples taken before, during, and after treatment was made to evaluate the effectiveness of this treatment. This experiment revealed that within the parameters tested, turbidity, TSS, and COD waste water recycle is feasible and can result in an aesthetically attractive domestic water supply which meets USPHS standards for turbidity of water. This process should also be considered as a means of tertiary treatment. (Ellis-Texas)
W71-06041

SURVEY OF DESALTING PROCESSES FOR USE IN WASTE WATER TREATMENT,
Oak Ridge National Lab., Tenn.
I. Spiewak.
In: Proceedings 9th Annual Environmental and Water Resources Engineering Conference, June 4-5, 1970, Nashville, Tennessee, Technical Report No 22, Department of Environmental and Water Resources Engineering, Vanderbilt University, p 153-178. 12 fig, 9 tab, 19 ref. Housing and Urban Development Interagency Agreement No IAA-H-3-69.

Descriptors: *Water treatment, *Waste water treatment, *Desalination processes, Distillation, Electrodialysis, Flash distillation, Ion exchange, Membrane processes, Reverse osmosis, Economics, Tertiary treatment, Demineralization.
Identifiers: Dynamic membrane hyperfiltration, Recycle.

Various processes were surveyed to determine feasible methods to prevent mineral buildup when reuse of waste water is necessitated in the future. A resume of a system of processes for water supply and waste water treatment is included along with desalination techniques available such as electrodialysis, reverse osmosis, dynamic membrane hyperfiltration, and distillation. Economic analyses, which compared systems with and without recycle, indicated that although tertiary waste treatments may increase the cost of sewage processing by factors of up to 4 times the overall cost of treatment and water supply need not be increased over 50%. This analysis excludes the cost of water distribution and sewage collection which are about 20c/1000 gals, but including them would make the difference in cost between conventional practice and complete recycle only about 30%. (Ellis-Texas)
W71-06042

DESIGN CRITERIA FOR MUNICIPAL WASTE WATER TREATMENT PLANTS IN TENNESSEE,
Tennessee Dept. of Public Health, Nashville. Div. of Sanitary Engineering.
J. W. Saucier.
In: Proceedings 9th Annual Environmental and Water Resources Engineering Conference, June 4-5, 1970, Nashville, Tennessee, Technical Report No 22, Department of Environmental and Water Resources Engineering, Vanderbilt University, p 111-130.

Descriptors: *Waste water treatment, *Design standards, *Specifications, *Standards, Permits, Industrial wastes, Sewerage, Pumping plants, Sedimentation, Aeration, Activated sludge, Lagoons, Tertiary treatment, *Tennessee, *Municipal water, *Municipal wastes, *Treatment facilities, Design criteria.

The Tennessee Department of Public Health has been assigned the responsibility of general supervision of construction, operation, and maintenance of all public waste water systems in Tennessee. The Department must review and approve all plans and specifications and to provide guidance in this matter 'Guide Lines for Review of Plans and Specifications for Waste water Treatment Facilities,' has been published. A resume of these guidelines is given for the new standards in Tennessee but for more complete information the basic regulation should be consulted. (Ellis-Texas)
W71-06043

ALTERNATIVES FOR THE TREATMENT AND DISPOSAL OF ANIMAL WASTES,
Cornell Univ., Ithaca, N.Y.
R. C. Loehr.
In: Proceedings 9th Annual Environmental and Water Resources Engineering Conference, June 4-5, 1970, Nashville, Tennessee, Technical Report No 22, Department of Environmental and Water Resources Engineering, Vanderbilt University, p 185-198. 2 fig, 2 tab, 10 ref.

Descriptors: *Farm wastes, *Water disposal, *Waste water treatment, Water pollution sources, Nutrients, Dentrification, Aeration, Nitrification, Nitrogen, Phosphorous, Oxidation, Oxidation lagoons, *Waste disposal, Solid wastes, Liquid wastes.
Identifiers: Oxidation ditches.

Confined animal production has caused new environmental problems for agriculture by producing large volumes of liquid and solid wastes for disposal. The excessive nutrients in animal wastes and waste waters have been noted as a cause of current and potential pollution problems. Technical processes are available that can treat these wastes but there is no one process or waste management system that is adequate for all animal operations. Aeration systems such as oxidation ditches underlying cattlebarus are gaining acceptance among livestock producers for ease of waste handling for odor control, and for treatment of this waste. Of the possible methods to reduce the concentration of nitrogen and phosphorous reaching surface and groundwaters from the disposal of animal waste waters, ammonia release, controlled nitrification and dentification, and crop or land management appear the most feasible. (Ellis-Texas)
W71-06044

SETTLING CHARACTERISTICS OF ACTIVATED SLUDGE AT LOW TEMPERATURE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
Sherwood Reed.
Available from NTIS as AD-717 239, $3.00 in paper copy, $0.95 in microfiche. CRREL Technical Report 203, Nov 1970. 30 p, 17 fig, 5 tab, 25 ref.
Identifiers: *Sewage, *Arctic regions, Chemical precipitation, Mathematical analysis, Design, *Sewage treatment, *Activated sludge process, *Clarification, Settling.

A series of activated sludge settling tests were observed with particle concentration and temperature as the controlled variables. Based on the experimental data, an equation defining settling velocity in terms of concentration, fluid temperature, and organic loading was developed. Although empirical in nature the equation provides a rational basis for the determination of temperature influence and should have special value for cold regions designs. It was possible to describe the results of other investigations with this equation.
W71-06107

WATER QUALITY MANAGEMENT PROBLEMS IN ARID REGIONS.
Robert S. Kerr Water Research Center, Ada, Okla.
Treatment and Control Research Program.
For primary bibliographic entry see Field 05G.
W71-06111

FOAM SEPARATION PROCESSES FROM INDUSTRIAL WASTE TREATMENT: PHENOL, PHOSPHATE, AND HEXAVALENT CHROMIUM,
Illinois Inst. of Tech., Chicago. Dept. of Civil Engineering.
R. B. Grieves.
Proceedings, Industrial Waste Conference, May 3, 4, 5, 1966, Purdue University, Vol L, No 2, p 192-202, March 1966. 8 fig, 7 ref. US Public Health Service Research Grant No WP 00702-02.

Descriptors: *Foam separation, *Industrial wastes, *Phenols, Phosphates, Hydrogen ion concentration, Surfactants, Waste water treatment, *Chromium, Metals, Inorganic compounds.
Identifiers: *Hexavalent chromium.

A comparison is made of previous studies of the residual ratios obtained from the batch foam separation of phenolate, orthophosphate, and dichromate, including the effects of pH and of the initial surfactant concentration; and the establishment of the feasibility of multicolumn, continuous ion flotation of dichromate for the removal and recovery of hexavalent chromium. Dichromate was shown to be least influenced by pH, and for a given surfactant concentration, considerably better results were achieved than for phenolate or phosphate. Combining several columns in series, multicolumn performances have been calculated including a four-column unit in which a 100 mg/l dichromate feed can be reduced to 3 mg/l, using 422 mg/l of surfactant. The combined collapsed foam stream contains 444 mg/l of dichromate and 1904 mg/l surfactant. (Ellis-Texas)
W71-06194

THE EFFECT OF CLAY MINERALS ON SURFACTANT BIODEGRADABILITY,
Rutgers-The State Univ., New Brunswick, N.J.
R. D. Barbaro, and J. V. Hunter.
Proceedings of the 20th Industrial Waste Conference, May 4, 5, 6, 1965, Engineering Bulletin of Purdue University, Vol XLIX, No 4, p 189-196, July 1965. 3 fig, 2 tab, 11 ref.

Descriptors: *Clays, *Biodegradation, *Surfactants, Bentonite, Degradation, Biology, Adsorption, Enzymes.
Identifiers: Kaolinite.

A study was made to observe the effect of several clay minerals upon the extent of biological degradation of several representative surfactants and to point the direction for further research in this area. The biological utilization of relatively degradable species of the 3 types of surfactants may be inhibited by small quantities of kaolinite and bentonite. The observed effect may be due to the adsorption and inactivation of substrate or enzymes. No significant effect of clay particles upon the utilization of the relatively nondegradable species of the 3 types of surfactants could be shown by this technique. (Ellis-Texas)
W71-06196

CONTROL OF INFILTRATION IN SEWER SYSTEMS-DESIGN AND MAINTENANCE,
Nashville Metropolitan Government and Davidson County, Tenn. Sewerage Services.
R. Harrington.
Proceedings, 8th Annual Environmental and Water Resources Engineering Conference, June 5-6, 1969, Technical Report No 20, Department of Environment and Water Resources Engineering, Vanderbilt University, p 11-17, (1969).

Descriptors: *Infiltration, *Sewers, Sewage disposal, Specifications, Groundwater movement, Soil water movement, Waste water treatment, Design standards, Materials testing.

The City of Nashville and the County of Davidson merged in 1963 and brought about an evolution in the design, construction, and maintenance of sanitary sewers. New specifications were required to upgrade the outdated standards of yesteryear. Modern technology has allowed a great reduction in the infiltration allowed under these new specifications at a reduction in initial cost. A change in pipe material, stone bedding, precast manholes, precast service connections, and improved stoppers have reduced the amount of infiltration into the sewerage of this community. (Ellis-Texas)
W71-06197

HYDRAULIC OVERLOADING-FACT OR FICTION,
Resource Consultants, Inc., Nashville, Tenn.
J. C. North, and H. D. Tomlinson.
Proceedings, 8th Annual Environmental and Water Resources Engineering Conference, June 5-6, 1969, Technical Report No 20, Department of Environment and Water Resources Engineering, Vanderbilt University, p 19-32, (1969). 16 ref.

Descriptors: *Waste water treatment, *Water treatment, Industrial wastes, Waste water disposal, Tertiary treatment, Storm runoff.
Identifiers: *Recycle.

The problem of handling present hydraulic overloading cannot be separated from other considerations of public interest involving water supply, domestic waste treatment, industrial waste treatment, and conservation of natural resources. Excessive flow in a sewer system or a waste treatment plant is a factor which often requires large capital outlays to correct and is partially responsible for the projected millions of dollars needed to update the existing systems. Reuse of treated waste waters is becoming more popular and economical. A brief review of the applicability of general reuse concepts is presented. (Ellis-Texas)
W71-06198

SOME FACTORS TO BE CONSIDERED IN THE DESIGN OF WASTE DISPOSAL WELLS,
Geological Survey, Nashville, Tenn., Water Resources Div.
D. R. Rima.
Proceedings, 8th Annual Environmental and Water Resources Engineering Conference, June 5-6, 1969, Technical Report No 20, Department of Environment and Water Resources Engineering, Vanderbilt University, p 119-127, (1969).

Descriptors: *Injection, *Waste water disposal, *Hydrologic properties, Groundwater recharge, Waste water treatment, Geologic formations, Hydraulic properties, Hydraulic gradients.
Identifiers: Hydrodynamic dispersion.

The hydrologic factors most commonly overlooked in the design of waste injection wells are natural hydraulic gradients and hydrodynamic dispersion within the proposed injection zones. Natural hydraulic gradients are known to exist in porous and permeable formations at depths of several thousands of feet beneath the land surface and exert a strong influence on the direction and rate of movement of liquid wastes in injection zones. Hydrodynamic dispersion results from velocity variations in laminar flow through porous media and can greatly expand the spread of contaminants from an injection well because the width of the envelope of dispersion increases in proportion to the distance traveled by the dispersing contaminant. (Ellis-Texas)
W71-06199

CONTROL OF WASTES FROM WATER TREATMENT PLANTS,
Virginia State Water Control Board, Richmond.
A. H. Paessler, and E. R. Sutherland.
Proceedings, 8th Annual Environmental And Water Resources Engineering Conference, June 5-6, 1969, Vanderbilt University, Department of Environmental and Water Resources Engineering, p 137-160, (1969). 19 ref.

Descriptors: *Water treatment, *Waste water treatment, *Waste water disposal, *Treatment facilities, Chemical precipitation, Lagoons, Regulation, Abatement.

A staff survey was made of municipal water treatment plants in order to develop criteria for the design of waste treatment facilities for wastes engendered by water treatment. The least expensive method, and most widely used is simple lagooning. Other methods such as sand drying beds, centrifugation, vacuum filtration, treating in sewage works, dilution, and recalcining are other possibilities f the treatment of this sludge. It is evident that t control of water treatment wastes is not depende on technological breakthroughs or massive mon tary investments, but depends primarily upon t determination of regulatory agencies to abate po lution from this source. (Ellis-Texas)
W71-06200

CASE HISTORIES: IMPROVED ACTIVATE SLUDGE PLANT PERFORMANCE BY OPERA TIONS CONTROL,
Federal Water Pollution Control Administratio Cincinnati, Ohio. Div. of Technical Services.
A. W. West.
Proceedings, 8th Annual Environmental and Wat Resources Engineering Conference, June 5-6 1969, Technical Report No 20, Department of E vironmental and Water Resources Engineerin Vanderbilt University, p 161-170, (1969).

Descriptors: *Activated sludge, *Waste wat treatment, Aeration, Biochemical oxygen deman Effluent, Trickling filters.
Identifiers: Suspended solids, Clarifiers.

Tests run on tightly controlled sewage treatme plants at Sioux Falls, South Dakota and at S Louis, Missouri document the excellent final e fluent quality that can be produced by presentl available secondary treatment processes. Opera tional results of one plant showed a 99% BOD an SS reduction with readily available, present-da treatment processes and equipment. If consisten effluent excellence is to be expected, the treatme facility must be properly designed with adequat built-in capacity and flexibility, plant charac teristics must be appropriate to the incoming load and the process must be skillfully controlled b conscientious, qualified operators. (Ellis-Texas)
W71-06201

IMPLICATIONS OF WATER QUALITY LAW FOR THE FEEDLOT INDUSTRY,
Oklahoma State Univ., Stillwater. Dept. of Agricul tural Economics.
For primary bibliographic entry see Field 05G.
W71-06222

ECONOMICS OF COMBINING DISTILLED SEAWATER AND RENOVATED WASTE WATER AS A NEW SOURCE OF MUNICIPAL WATER SUPPLY,
Bechtel Corp., San Francisco, Calif.
For primary bibliographic entry see Field 03A.
W71-06238

METHANOL REQUIREMENT AND TEMPERATURE EFFECTS IN WASTE WATER DENITRIFICATION,
Gulf South Research Inst., New Iberia, La.
Shirish G. Dholakia, James H. Stone, and Harry P. Burchfield.
Copy available from GPO Sup Doc as EPA-WQO Report No 17010 DHT, August 1970, $0.50; microfiche from NTIS as PB-198 221, $0.95. 38 p, 7 fig, 6 tab, 14 ref. EPA-WQO Contract No 14-12-527.

Descriptors: *Dentrification, *Waste water treatment, *Temperature, Dissolved oxygen, Tertiary treatment, Pilot plants, Chemical reactions, *Water reuse, Nutrients, Eutrophication, Ammonia, Nitrates, Nitrites.
Identifiers: *Methanol requirement, Packed column reactor, Suspended growth reaction.

A pilot-scale, denitrifying plant was built using two types of continuous-flow reactors, a packed column and a suspended growth chamber. Dentrification at three temperature regimes and three dissolved oxygen levels was studied as a function of the methanol:NO3-N ratio. The most efficient ratio was usually found to be between 2:1 and 3:1. Effective dentrification at lower temperatures and high

dissolved oxygen required ratios equal to or slightly greater than 3:1.
W71-06246

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS.
Franklin Inst. Research Labs., Philadelphia, Pa.
For primary bibliographic entry see Field 04C.
W71-06253

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS (FIRST QUARTERLY ISSUE).
Franklin Inst. Research Labs., Philadelphia, Pa.
For primary bibliographic entry see Field 04C.
W71-06254

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS (SECOND QUARTERLY ISSUE).
Franklin Institute Research Labs., Philadelphia, Pa.
For primary bibliographic entry see Field 04C.
W71-06255

WASTE REDUCTION IN FOOD CANNING OPERATIONS,
National Canners Association Research Foundation, Berkeley, Calif. Western Research Lab.
Walter A. Mercer, and Walter W. Rose.
Copy available from GPO Sup Doc as I67.13/4: 12060 - 08/70, $1.00; microfiche from NTIS as PB-198 231, $0.95. EPA-WQO Report 12060, August 1970. 89 p, 17 tab, 31 fig, 4 append. EPA-WQO Grant WPRD 151-01-68.

Descriptors: *Canneries, *Industrial wastes, *Disinfection, *Screens, *Trickling filters, *Separation techniques, Water pollution control, Waste water treatment.
Identifiers: *pH control, *Peach wastes, Tomato wastes.

Trickling Filter--The effects of hydraulic loading and nutrient addition on soluble B.O.D. removal from fruit waste water were investigated. In 1968, at 1250 gpd/sq ft without nutrient addition, 190 lbs of B.O.D./1000 cu ft/day were removed; with nutrient (anhydrous ammonia) addition, 450 lbs of B.O.D. were removed. At 2200 gpd/sq ft, B.O.D. removal decreased slightly. pH Control--Fruit pumping water was acidified with citric acid and controlled at pH 4.0 or below to inhibit bacterial growth and to extend the use of recirculated water. The daily discharge volume of acidified system was 6720 gallons containing 118 lbs of B.O.D.; non-acidified, 26,520 gallons, 170 lbs B.O.D. Air Flotation System--Removal from peach rinse water was 65 to 93 percent at 2700 gpd/sq ft and 1400 gpd/sq ft respectively. A 70 percent removal was maintained at 2300 gpd/sq ft for peach and 1400 gpd/sq ft for tomato waste water. Screens--The maximum capacity of the single (20 mesh) deck was 1000 gpm. Compared to 20 mesh rectangular screen, 48 mesh removed 32.2 percent more solids. For the double deck unit containing a 20 mesh top and 100 mesh bottom, the unit handled 1500 gpm - 1.5 times the single deck unit. (Rose-Nat'l Canners Assoc)
W71-06257

DEVELOPMENT OF NEUTRON ACTIVATION FOR INVESTIGATION OF WATER CLARIFICATION,
Missouri Water Resources Research Center.
Louis Hemphill, and Gary C. Batz.
Available from NTIS as PB-198 235, $3.00 in paper copy, $0.95 in microfiche. Completion Report, Missouri Water Resources Research Center, September 1970. 15 p, 3 tab, 2 fig. OWRR Project A-026 MO (1).

Descriptors: *Coagulation, *Flocculation, *Neutron activation analysis, Zeta potential, Waste water treatment, *Water purification, Electrophoresis, Clays.

The objective of this research was to determine if activation analysis could be used to investigate coagulation-flocculation reactions. Experimental study of the coagulation-flocculation reaction was developed by preparing clay-water mixtures using montmorillonite and illite clay samples and a standard ionic solution. Samples of the clay material were subjected to neutron activation for various times and neutron flux values. The irradiated clay samples were blended with stable clay materials and subjected to electrophoresis. Results of this study showed that clay minerals can be activated to a high value by thermal neutron irradiation and that the neutron irradiation can be controlled to increase the yield of specific radionuclides. Experimental results also showed that the clay particle migrated as a integral unit particle during electrophoresis.
W71-06265

A RATIONAL APPROACH TO THE DESIGN OF AERATED SEWAGE LAGOONS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
Edward F. Pohl.
Available from NTIS as AD-717 241, $3.00 in paper copy, $0.95 in microfiche. Special Report 136, October 1970. 25 p, 9 fig, 4 tab, 27 ref.

Descriptors:
Identifiers: *Sewage, *Arctic regions, Military facilities, Oxygen, Design, *Sewage treatment, Secondary sewage treatment, Lagoons (Ponds), *Activated sludge process, *Biochemical oxygen demand, *Aeration.

The use of aerated lagoons as an economical sewage treatment system is a recently developed concept. Its adaptability to arctic and subarctic environments has been established through test programs in Alaska. This report summarizes current developments and discusses the physical and biochemical parameters which must be considered during design.
W71-06267

SURVEY OF DESALTING PROCESSES FOR USE IN WASTE WATER TREATMENT,
Oak Ridge National Lab., Tenn.
I. Spiewak.
Available from NTIS as ORML-TM-3155, $3.00 in paper copy, $0.95 in microfiche. Report ORNL-TM-3155, September 1970. 30 p, 10 fig, 2 tab, 19 ref. HUD Agreement No IAA-H-3-69.

Descriptors: *Waste water treatment, Water reuse, *Sewage treatment, *Desalination processes, Cost analysis, Costs, Tertiary treatment.

This report is based on one of a series of investigations sponsored by the Department of Housing and Urban Development to determine the benefits which might be gained from urban energy centers. A review is given of processes used for waste water treatment, emphasizing new processes which appear to have potential for combination with desalting. A survey of developmental application of desalting processes to wastes is given. Cost estimates are given for a number of possible systems using desalting to treat effluent from a city of 1 million population. The analysis indicates that, although advanced waste treatments may increase the cost of sewage processing by factors of up to four times, the overall cost of water supply, sewerage and treatment need not be increased over about 30 per cent. It is concluded that desalting is primarily of value in systems which provide reusable product water. Such systems generate waste brines very difficult to dispose of, in many cases, except by distillation to dryness.
W71-06268

RADIATION TREATMENT OF SEWAGE,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
E. A. Newland.
Available from NTIS as AAEC/LIB/BIB-254, $3.00 in paper copy, $0.95 in microfiche. AAEC, LIB, BIB No 254, Sept 1970. 9 p.
Identifiers: *Sewage treatment, *Irradiation, *Bibliographies, Sewage treatment.

Literature was searched for the period 1948-1970 to produce a bibliography of 48 journal citations arranged chronologically by year.
W71-06271

HEARING BY DELAWARE RIVER BASIN COMM'N TO EXPAND THE COMPREHENSIVE PLAN.
For primary bibliographic entry see Field 05G.
W71-06275

LOW-PRESSURE AIR TESTS FOR SEWER LINES,
For primary bibliographic entry see Field 08A.
W71-06299

SCREEN TREATMENT FOR SEWER OVERFLOWS.

Am City, Vol 84, No 3, p 24, Mar 1969.

Descriptors: *Screens, Storm runoff, Overflow, Oregon.
Identifiers: *Runoff treatment, Combined sewers.

An alternative to separation of combined sewers in Portland, Oregon is being tested under a FWPCA grant. The experimental pilot plant includes high-rate, fine-mesh screens which treat overflow that is pumped to the plant during periods of heavy rainfall. Previously, only one-third of the rainy season flow was treated while the remainder was discharged untreated into a receiving stream. A description of the structure and workings of the screen operation is given. Laboratory tests will determine the effectiveness and feasibility of the system.
W71-06333

ISLAND CITY SOLVES TOUGH SEWERAGE PROBLEM.
For primary bibliographic entry see Field 08A.
W71-06346

CONSTRUCTION COST REQUIREMENTS FOR WATER AND WASTE WATER FACILITIES.

Public Works, Vol 98, No 12, p 112-113, Dec 1967.

Descriptors: *Cost analysis, Waste water treatment.
Identifiers: *Waste water facilities.

The Business Defense Services Aministration surveyed 1200 major water utilities in order to predict the construction cost requirements for water and waste water facilities. The forecasted average annual expenditure over the 14-year period (1967-1980) showed a 139% increase over annual amounts for the past 12 years. These expenses result from the need to remedy present defects, to account for depreciation and obsolescence, and to counter the demands of an increasing population. Data included indicating costs required for various types of water supply and waste water utilities in addition to amounts to be spent to combat individual problems can serve to guide manufacturers in planning future construction.
W71-06347

SOME ASPECTS OF SEWAGE TREATMENT AT COVENTRY,
R. W. Brooks, H. V. Lee, and M. J. Price.
Water Pollution Control, Vol 68, No 2, p 129-145, Mar 1969.

Descriptors: *Sewage treatment, *Sludge treatment, *Filtration, Storm runoff.
Identifiers: *Storm sewage, Storm overflows, Sewer hydraulics, Great Britain.

An historical progress report of Coventry involving the sewage treatment outline development, activated sludge treatment, and sand filtration is presented. In the 1960's, the elimination of direct storm overflows and the provision of regional storm sewage balancing stations was initiated. Excess flow would be diverted to tanks at the stations until available capacity could be made in the sewer downstream and pumps then could automatically return the contents of the tanks. In the reply to the discussion following the article the limits for discharges from the storm overflows are presented.
W71-06366

WATER TREATMENT - A GUIDE TO THE TREATMENT OF WATER AND EFFLUENTS PURIFICATION: CHAPTER 13 - INTRODUCTORY: SEWER SYSTEMS--OVERFLOWS-CONSERVANCY,
G. V. James.
The Technical Press Ltd, London, p 247-252, 1966. 1 fig, 5 ref.

Descriptors: *Sewerage, *Flow characteristics, *Sewers, *Overflow, *Weirs, Sewage treatment.
Identifiers: *Storm overflows.

General facts concerning sewage and sewer systems are presented, including explanations of sewage 'strength'; variations in flow; the influence of seasonal and weather changes; and the three types of sewerage systems--combined, partially separate, and entirely separate. The operation of local storm overflows to relieve tributary sewers before they are surcharged is described. The three types of overflows are: the ordinary weir type; the improved weir type with a horizontal iron plate and a vertical deflecting plate directing water to the overflow pipe; and the leaping weir type, the best of the three sewage treatment processes mentioned include: chemical precipitation; use of comminutors; and dilution, bleaching and trenching of cesspoool contents.
W71-06371

ALTERNATIVES TO SEPARATION OF COMBINED SEWERS,
D. H. Waller.
Paper presented at the 21st Annual Meeting of the American Water Works Association, Atlantic Branch, Canadian Section, Oct 8, 1968.

Descriptors: *Pollution abatement, *Application methods, *Separation techniques, Overflow.
Identifiers: Combined sewers.

The drawbacks of separation include high costs, public inconvenience during construction, and the continuing problem of polluted stormwater runoff. Alternative solutions to this pollution problem either reduce pollutants in the overflow or decrease amounts of combined sewage that is overflowed. Pollutants can be eliminated from overflows through storage and treatment methods such as disinfection, screening, sedimentation, filtration, and other overflow devices. Possible procedures for diminishing combined sewage overflows outlined include real-time control of discharge points, storage by use of larger pipes, or increased interceptor and treatment plant capacity. Each locality's circumstances will determine which method or combination of methods will provide the best means for solving its pollution problem.
W71-06374

A RE-EXAMINATION OF THE STORM TANK PROBLEM,
L. S. Escritt.
Water Waste Treat, Vol 12, No 9, p 298-300, Sep/Oct 1969. 1 tab.

Descriptors: *Sewers, *Overflow, *Treatment facilities, *Design, Sewage treatment.
Identifiers: *Storm tank, *Capacity, *Stormwater treatment.

Where sewage works treat flow from catchments which are served by combined or partially-separate sewers, a moderately intense railfall-runoff rate will necessitate passage or storm-tank storage of excess flow. The Royal Commission on Sewage Disposal makes recommendations regarding the handling of such overflows. The author of this paper disputes their statement that storm tanks able to hold one-quarter of the daily dry-weather flow will suffice for storing spill-over from small storms. He notes that a capacity of two days dry-weather flow is often needed to prevent spill-over occurring. Functions of storm tanks and the mathematics of stormwater treatment are described. A suggested design for tanks consists of circular tanks with rotating sludge mechanisms. A formula for calculating the required capacity of a tank to prevent spill-over is included.
W71-06377

THE DISCHARGE OF STORM SEWAGE TO PUBLIC WATERS FROM AREAS OF GROUNDS WHICH ARE ENDANGERED BY OIL, IN CONNECTION WITH THE CLEAN WATER ACT FOR BERLIN,
K. H. Salewski.
Gesunh Ingr, (GEINA5), Vol 87, p 265-266, 1966.

Descriptors: *Legislation, *Surface waters, *Separation techniques.
Identifiers: *Germany, Storm sewage, *Oil separators.

In connection with the legislation for the protection of Berlin surface waters, which prohibits the discharge of oil emulsions, the author discusses the use of oil separators for areas where large volumes of oil are handled and where spillage is washed off into the receiving water by rainfall. These oil separators can be installed in sections along areas likely to be affected before storm sewage enters the receiving waters. Standards for the design of such separators are discussed.
W71-06388

STORM WATER TREATMENT AT CLEVELAND,
George D. Simpson, and Lamont W. Curtis.
J. Water Pollution Control Fed, Vol 41, No 2, Part 1, p 151-168, Feb 1969. Paper from Am Water Works Assoc - 88th Annual Conference, Cleveland, Ohio June 2-7, 1968.

Descriptors: *Watersheds (Basins), *Multiple-purpose projects, *Pressure conduits, *Pumping plants, *Water pollution control, *Chlorination, *Pollution abatement, *Lake Erie, Biological treatment, Reduction (Chemical), Recreation facilities.
Identifiers: *Gravity sewer, *Cleveland, Ohio.

A feasibility study was conducted for the FWPCA of a proposed offshore stabilization-retention basin, for the treatment of various polluting flows now being discharged to Lake Erie. The basin would receive treated effluent flow from the City's Easterly Waste water Treatment Plant, as well as flow from six large combined sewer overflow outfalls, and flow from five polluted streams which drain the service area. The proposed basin would be approximately 900 acres in area, with a mean water depth of 33.5 ft. A shoreline collection system is included to convey flows to two central points for discharge into the basin. The collection system will consist of a combination of gravity and pressure conduits, with two pumping stations. Two basic types of purification processes will take place in the basin. Biological and chemical oxidation will result in reduction of BOD and COD; this process will require an aerobic environment. Sedimentation of fine suspended solids, particularly the activated sludge cell matter in the treatment plant effluent, will require quiescent settling. To meet these two conditions, a two stage basin is contemplated. The first stage will be maintained in aerobic condition by air-lift or mechanical pumping. In the quiescent sedimentation stage, it is expected that an upper layer of five to ten feet of water will be aerobic, with the remainder of the depth anaerobic. The basin will create a sheltered bay at the shoreline, which will be used for boating, fishing and swimming. A small boat marina is contemplated as part of the overall project. The basin will be provided with facilities for chlorination. Effluent will be discharged at about 8,000 ft. from shore in water depth of approximately 42 ft. The basin has been found feasible from the standpoint of pollution abatement and reduction of bacterial contamination of the City's beaches resulting from polluted discharges.
W71-06389

OPTIMIZING WASTE TREATMENT CONTROL SYSTEMS,
Ernest T. Williams, Jr.
Paper presented at the Third Annual National Pollution Control Conference and Exposition, April 3, 1970, San Francisco, California.

Descriptors: *Instrumentation, *Waste treatment, *Control systems, *Measurement.

As waste treatment and recovery processes become more complex and costly, there is increasing reliance upon instrumentation to assume control responsibility for the most economic and efficient operation. This paper describes the control systems normally used on four applications, and discusses what can be done to optimize performance. The use of dissolved oxygen and sludge density measurement in the activated sludge process is explored. The second application is pH neutralization. Feedforward control and the nonlinear controller have dramatically improved neutralization performance. Improvements are also suggested for the control schemes of chromate waste and cyanide waste treatment processes.
W71-06414

CLEANING OUR ENVIRONMENT-THE CHEMICAL BASIS FOR ACTION: SECTION 2 THE WATER ENVIRONMENT: MUNICIPAL WASTE WATER TREATMENT.
Subcommittee on Environmental Improvement, Committee on Chemistry and Public Affairs American Chemical Society, p 106-122, 1969. 2 fig, 3 tab.

Descriptors: *Waste water treatment, *Overflow, *Storm runoff, *Flocculation, *Treatment facilities, *Water reuse, Sewage treatment, Storage tanks, Underground storage.
Identifiers: *Combined sewers, *Stormwater quality.

This subsection discusses existing processes, recent advances, and current problems relating to municipal waste water treatment. Urban stormwater problems from combined sewer overflows are explained, and possible solutions presented, such as storing overflow and then passing it to plants for skimming and sedimentation and/or polymer flocculation treatment. Other means of handling overflows include storage in fully or partially flexible underwater tanks or in underground tunnels with subsequent treatment, chlorination, and filtration aided by ultrasonic energy. One current project is evaluating the use of 1-2-acre ponds to collect stormwater runoff and then treat it for reuse. The following recommendations in the area of municipal waste water treatment were made: (1) more research by biochemists and biologists on sewage treatment, primarily to seek radical innovations based on fundamentals of microbiological processes; (2) research expansion on new methods of handling waste water treatment sludges and on parameters involved in using synthetic polymers and polyelectrolytes to improve flocculation, sedimentation, and conditioning of such sludges; and (3) more systematic studies on urban stormwater

uality to provide a sounder base for evaluating arious means of treatment.
W71-06415

OXIDATION DITCH TREATMENT OF SWINE WASTES, SUMMARY REPORT,
Illinois Univ., Urbana.
P. L. Day, D. D. Jones, J. C. Converse, A. H. Jensen, and E. L. Hansen.
A condensation of this paper is published in Agricultural Engineering, Vol 52, No 2, p 71-73. February 1971. Complete report available from ASAE, St. Joseph, Mich. 49085. Price is $1.00 per copy. American Society of Agricultural Engineers, Paper No. 69-924. 16 p, 1 tab, 9 fig, 24 ref. Bureau of Solid Waste Management Research Grant No. EC-00245-03, also Reg Res Proj NC-69.

Descriptors: *Farm wastes, *Waste water treatment, Hogs, Slurries, Odors, Livestock, Effluents, Mechanical equipment, Protozoae, Biochemical oxygen demand, Chemical oxygen demand, Farm lagoons, Sludge, Aerobic treatment, Biological treatment, Liquid wastes, Laboratory tests, Design criteria, *Oxidation lagoons.
Identifiers: Oxidation ditches, Pasveer oxidation ditch, Slotted floor, Livestock buildings, Ciliated protozoan, Swine, Oxygenation capacity, Loading rates, Field tests.

Swine wastes research for the three-year period beginning September 1, 1966 is summarized. Upon finding that swine manure could be aerobically treated, a modification of the Pasveer oxidation ditch was tested. The in-the-building oxidation ditch has proven itself in the field as capable not only of eliminating objectionable odors from manure pits but of reducing the BOD5 pollutional value of the waste by about 90 percent. The volatile solids can also be reduced by about 50 percent. Even so, the mixed liquor should not be discharged directly into a stream. There will, however, be surplus water and sludge to be disposed of, as with any other waste-treatment system. Operating the ditch with a constant liquid depth and a constant rotor immersion depth is recommended for operator convenience. This can be done by using an overflow. Having the mixed liquor overflow into an aerobic lagoon is also in keeping with operator convenience and low labor requirements. The lagoon can have a fluctuating depth, so that surplus water and sludge can be removed at a convenient time. The simplest method is by using irrigating equipment. (Christenbury-Iowa State)
W71-06442

EFFECTS OF SURFACE RUNOFF ON THE FEASIBILITY OF MUNICIPAL ADVANCED WASTE TREATMENT,
Iowa State Univ., Ames. Dept. of Civil Engineering.
Robert E. Baumann, and Sheldon Kelman.
Agricultural Practices and Water Quality, Iowa State University Press, Ames, Iowa, 1970, Chapter 25, p 344-362. 7 fig, 1 tab, 19 ref.

Descriptors: *Surface runoff, *Sewage treatment, Tertiary treatment, Biochemical oxygen demand, Industrial wastes, Farm wastes, Pollutants, Fertilizers, Nitrogen, Nitrates, Phosphorus, Phosphates, Algae, Eutrophication, Water quality, Rivers, Iowa, Corn, Discharge, Chlorophyll.
Identifiers: Industrial water pollution, Des Moines River, Packing plants.

The protection of the quality of water in Iowa streams requires that attention be directed at the various contributors of the significant pollutants. Attention is currently being directed at municipal and industrial wastes discharges, since these enter streams through a point source and are easily controlled. All such wastes must be given secondary treatment prior to discharge to Iowa's streams. As more stringent treatment requirements are demanded in the future, there is some question as to whether nutrient removals from municipal and industrial wastes will be sufficient to protect the stream. This study indicated that during periods of dry weather when light and turbidity conditions are favorable for phytoplankton growth, the principal source of the N and P required to support such growth is derived from municipal and industrial waste water discharges. Removal of N and P from such waste water discharges will help reduce phytoplankton growth. In periods of high stream flow, when turbidity levels are high enough to be unfavorable to phytoplankton growth, runoff from urban and rural lands and channel erosion are probably the principal contributors of N and P to the stream. Removal of N and P from municipal and industrial wastes during these periods will not reduce nutrient levels significantly. Under the latter conditions, tertiary treatment of municipal and industrial wastes will be of less benefit until runoff contributions of N and P are also controlled. (See also W71-05437) (White-Iowa State)
W71-06445

LIQUID HANDLING OF POULTRY MANURE,
Massachusetts Univ., Amherst. Dept. of Agricultural Engineering.
Curtis A. Johnson.
ASAE Paper No NA 64-501. Transactions of the American Society of Agricultural Engineers, Vol 8, p 124-126, 1965. 2 fig, 1 tab, 6 ref.

Descriptors: *Liquid waste, *Order, *Septic tanks, *Water reuse, Farm waste, Sludge disposal, Poultry, Ammonia, Disposal, Design criteria, Cost comparisons, Effluents, Waste water treatment.
Identifiers: *Recycling, Liquid-manure handling, Ammonia odor, Congdon system.

This article describes an integrated system concept for liquid manure handling of waste produced by laying hens in conventional commercial cage units. The bird droppings in this unit collect in 8 inch deep, 44 inch wide troughs formed on original floor with 4 inch thick concrete blocks. The lower end of each sloped trough is closed with a 2 inch x 6 inch board. These boards are removed to empty the troughs into a 24 inch by 24 inch trench running across the end of the building below floor level. This sloping trench empites into a 12 inch diameter plastic pipe which conveys the waste to an underground septic tank. From the third compartment of this three-compartment tank the effluent is pumped back into the laying house to hydraulically clean the troughs beneath the cages. The effluent becomes increasingly concentrated. The effluent is periodically pumped onto forest land and the sludge is 'batch' handled. This manure system provides: (1) Easy manure handling, (2) Few moving parts, (3) Little ammonia odor, (4) Low water usage, (5) Simple manure disposal, (6) Low-cost pit cleaning. (Parker-Iowa State)
W71-06450

AGRICULTURE WASTE RESEARCH NEEDS,
Cloisterdale Farms, Ephrata, Pa.
Glenn H. Herr.
Compost Science, Journal of Waste Recycling, Vol 11, No 5, Sept-Oct 1970, p 8-11. 4 fig.

Descriptors: *Farm waste, *Poultry, *Disposal, *Drying, Odor, Costs, Equipment, Aeration, Lagoons, Irrigation, Waste water treatment.
Identifiers: SHUD, Neighbors.

The author is responsible for disposal of 17,000 plus or minus tons of raw waste annually from a laying hen complex of 360,000 hens. Their problems incidental to poultry 'SHUD' were: first - volume accumulation of shud within houses, second - community relations - odor primarily; danger of soil and water pollution secondarily. Third - ultimate disposal, and, finally fourth - the unknown factor of the possibility of, or the effect of, gas toxicity to the chickens and humans. Some of their attempted and/or considered methods for disposal were the use of: (1) lagoons; (2) irrigation; (3) sewage treatment plant; (4) incineration; (5) burying; (6) hauling and spreading; future consideration: (7) semidrying; (8) possible dehydration - which might lead to: fertilizer products; re-feeding; or some other uses. Their conclusion was that liquid handling would not be the long range answer to their problems. They concluded that some method of dry or semi-dry procedure must develop as their solution and as an industry solution. Mr. Herr describes the system of drying the manure in place and the cost of disposal of the simi-dried (30%) SHUD. (Christenbury-Iowa State)
W71-06452

ANAEROBIC DECOMPOSITION OF SWINE EXCREMENT,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
O. E. Cross, and Alvaro Duran.
Nebraska Agricultural Experiment Station Journal Paper No 2531. Transactions of the ASAE, Vol 13, No 3, May 1970, p 320-322. 11 fig, 7 ref.

Descriptors: *Farm wastes, Laboratory tests, *Anaerobic digestion, *Hogs, Anaerobic conditions, Temperature, Sludge, Biochemical oxygen demand, Hydrogen ion concentration, Waste water treatment.
Identifiers: Swine, Loading rates, Volatile solids, Detention times, Digesters.

This paper presents a laboratory analysis on the anaerobic digestion of swine excrement as affected by temperature and loading rate. The tests were run for 15 days. The experiments were conducted using ambient temperatures of 50, 70, and 90 F. at three loading rates. The loading rates were 3.2, 1.6, and 0.8 g. of volatile solids per liter of digester volume per day. Volatile-solids content was determined daily during a 15-day test period. Moisture content, total solids, fixed solids and pH were also determined daily. A 5-day BOD test was performed. None of the experiments reached equilibrium; however, it was possible to detect a tendency of the system to approach equilibrium or to approach failure. The results showed that for a load of 0.8 g. at all temperatures the system indicated success in the digestibility of the organic matter. At a load of 3.2 g. at 70 F and 50 F the system tended toward failure. (Christenbury-Iowa State)
W71-06453

USE ANIMAL MANURE EFFECTIVELY,
Arizona Agricultural Experiment Station, Tucson.
J. L. Abbott.
Agricultural Experiment Station and Cooperative Extension Service Bulletin A-55, The University of Arizona. 3 tab, 1 fig, 6 ref.

Descriptors: *Farm wastes, *Fertilizers, *Rates of application, *Return (Monetary), *Beneficial use, Livestock, Arizona, Feedlots, Disposal, Costs, Salts, Nitrogen, Organic matter, Waste treatment.
Identifiers: Manure, Composting.

This publication discusses some important considerations that should be taken into account concerning the use of animal manure as a fertilizer. A possible $90-per-acre return for a $20-per-acre investment is being overlooked by many Arizona farmers. The cost of applying manure is in the order of $2 to $14 per ton up to a 40 mile haul. The fertilizer value of manure is at least $2 per tone for available N and P. The value of organic matter must account for the balance in cost. The greatest value of manure may result from the indirect effects of the organic matter contribution on the physical condition of the soil and in maintaining the availability of certain soil nutrients. The soluble salts in manure commonly range from 5 to 10 percent on a dry basis. Recommendations for manure are seldom more than 5 tons per acre annually. (Christenbury-Iowa State)
W71-06454

5E. Ultimate Disposal of Wastes

THE PRESENT STATE AND PROSPECTS OF DEVELOPMENT IN RADIOACTIVE WASTE MANAGEMENT IN THE USSR,
Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii SSSR, Moscow.
B. S. Kolychev, and V. M. Sedow.
Atomic Energy Review, Vol 5, No 4, p 123-150, 1967. 16 fig, 7 tab, 28 ref.

Descriptors: *Radioactive waste disposal, *Ultimate disposal, *Technology, Nuclear wastes, Costs, Waste storage, Waste disposal, Waste water treatment, Pilot plants, Safety, Nuclear reactors, Radioactive wastes, Waste treatment, Nuclear wastes, Drying.
Identifiers: *USSR, Decontamination, Solidification, Burial, Cementation, Bituminization.

This report summarized different chemical methods of liquid radioactive waste decontamination. Combined liquid and solid waste burial following cementation was put in practice. Waste disposal into deep geological formations is fairly safe and the cost does not exceed 1 ruble per cu meter. Studies are under way on solidification of wastes by drying and bituminization, and on the development of reactor cleaning process using electrophoresis and pre-coated filters. Attention has also been paid to new designs of evaporators, driers, electrodialyzers, centrifuges, filters, and equipment for treatment and burial of radioactive wastes. (Wilde-Wisconsin)
W71-06006

BIOLOGICAL CONCEPTS AND INDUSTRIAL WASTE DISPOSAL PROBLEMS,
Academy of Natural Sciences of Philadelphia, Pa.
For primary bibliographic entry see Field 05D.
W71-06038

CRAGE V CITY OF BUFFALO (DUTY OF CITY TO PROVIDE FOR SEWAGE DISPOSAL).
For primary bibliographic entry see Field 06E.
W71-06170

SOME FACTORS TO BE CONSIDERED IN THE DESIGN OF WASTE DISPOSAL WELLS,
Geological Survey, Nashville, Tenn., Water Resources Div.
For primary bibliographic entry see Field 05D.
W71-06199

SOLID WASTE DEPOSITION AND WATER PROTECTION (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
Von Hans R. Wasmer.
Gas-Wasser-Abwasser, Schweiz Vol 49, No 5, 1969. 2 fig, 4 tab, 5 ref.

Descriptors: *Waste disposal, *Waste treatment, *Waste dumps, Oceans, Landfills, Diffusion, Bacteria.

All of this planet's waste must be deposited or disposed of somewhere. The relationship of air-water-ground waste disposal is discussed. Advantages and disadvantages of landfills, ocean dumping, bacterial treatment and diffusion are considered. (Ensign-PAI)
W71-06210

A FEASIBILITY ANALYSIS OF INCINERATOR SYSTEMS FOR RESTORATION OF OIL CONTAMINATED BEACHES,
Envirogenics Co., El Monte, Calif. Division of Aerojet-General Corporation.
R. M. Roberts, and T. S. Hoyt.
Copy available from GPO Sup Doc as I67, 13/4; 15080 DXE 11/70, $0.75; microfiche from NTIS as PB-198 227, $0.95. EPA-WQO Report 15080 DXE, November 1970. 73 p, 16 fig, 10 tab, 37 ref. EPA-WQO Contract 14-12-595.

Descriptors: *Beaches, *Oil wastes, *Cleaning, Shore Protection, Shores, Coasts, Incineration, Oily water, Disposal, Wastes, Burning.
Identifiers: *Oil spills, *Beach decontamination.

The feasibility of employing a combustion effect for restoring oil contaminated beaches was investigated. Beach access problems and the handling characteristics of shore materials limited the potential application to recreational (sand) sites. Thermodynamic arguments required that a system design be adopted in which the contaminated sand would undergo combustive processing in a confined arrangement. The design selected, from those analyzed, proved to be a three-effect combustor based on the rotary kiln principle. Provided that the sand to be cleaned is carefully enough collected to furnish a reasonable (greater than or equal to 6%) oil content and is moved away from the surf and drained to an acceptable moisture level (less than or equal to 6%) processing costs would be highly attractive. In comparison with uncontaminated sand, the cleaned product exhibits only a slightly greyish hue.
W71-06252

AERIAL PHOTOGRAPHIC TRACING OF PULP MILL EFFLUENT IN MARINE WATERS,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W71-06258

ULTIMATE DISPOSAL OF INDUSTRIAL WASTE: AN OVERVIEW,
Advanced Waste Research Program, Cincinnati, Ohio.
Robert B. Dean.
Technology Review, Vol 73, No 5, p 20-25, March 1971.

Descriptors: *Ultimate disposal, *Waste disposal, *Sludge disposal, *Brine disposal, *Land reclamation, Deep wells, Oily water, Food chains.
Identifiers: *Ocean disposal, Waste recovery.

Some industrial wastes can be reused, but by no means all, so the task of final disposal remains with us. This article surveys the routes that are available: their capabilities and limitations for particular chemical classes of waste substances. (Dean-EPA/WQO)
W71-06259

MARINE WASTE DISPOSAL AND SEA URCHIN ECOLOGY,
California Inst. of Tech, Pasadena.
For primary bibliographic entry see Field 05C.
W71-06262

STATE BOARD OF HEALTH (DISPOSAL OF SEWAGE AND SOLID WASTES).
For primary bibliographic entry see Field 06E.
W71-06278

OXIDATION DITCH TREATMENT OF SWINE WASTES, SUMMARY REPORT,
Illinois Univ., Urbana.
For primary bibliographic entry see Field 05D.
W71-06442

5F. Water Treatment and Quality Alteration

WATER AND MAN'S HEALTH,
Agency for International Development, Washington, D.C. Office of Human Resources and Social Development.
Arthur P. Miller.
Available from NTIS as PB-196 350, $3.00 paper copy, $0.95 in microfiche. AID Commu Water Supply Technical Series No 5, July 1 (Reprint). 92 p, 252 ref.
Identifiers: *Water pollution, *Public hea *Water resources, Public health, Diseases, Ini tious diseases, Parasites, Water quality, Wa supply, Radioactive wastes, Water consumpti Chemical compounds, Contaminants, Wa chemistry, Toxicity, Humans, Water treatme Mortality.

Introductory sections of this booklet discuss the portance of water to human beings. Other secti consider parasites and water, relationship of wa to other diseases and to chemical substances p ticularly radioactive materials.
W71-06108

ALGICIDES,
Wisconsin Univ., Madison. Water Resour Center.
For primary bibliographic entry see Field 05C.
W71-06189

DEVELOPMENT OF NEUTRON ACTIVATI FOR INVESTIGATION OF WATER CLARI CATION,
Missouri Water Resources Research Center.
For primary bibliographic entry see Field 05D.
W71-06265

THE WRAY FLOOD DISASTER AND ITS E FECTS ON THE PUBLIC HEALTH SERVICES
D. H. Maud.
Inst Public Health Engrs. Vol 67, Part 4, p 244-24 Oct 1968.

Descriptors: *Storm runoff, *Outlets, *Bypass Sewage treatment, Repairing, Sewage.

Intense thunderstorms and flooding damaged t water supply system and sewerage and sewa disposal systems of the town of Wray on the riv Roeburn. As a result of the storm, the outlet pip which allowed storm water overflow to pass to th river, was completely filled with silt as were oth parts of the sewage disposal system. In addition repairs on the sewer disposal and sewerage system town workers cleared the outfall pipe, thu establishing a bypass to the river. They then co nected the washout valve on the filter feedline ne the dosing chamber to the humus tanks. By re opening the inlet valve to the primary sedimenta tion tank and opening the dosing chamber washout, primary tank effluent was routed to th humus tanks; and thus, a two-stage settlemen treatment system was instituted in place discharging raw sewage over the side weir storm overflow.
W71-06386

5G. Water Quality Control

REMOVAL OF CONTAMINANTS FROM LAK ONTARIO BY NATURAL PROCESSES,
Canadian Oceanographic Data Centre, Ottaw (Ontario).
H. E. Sweers.
In: Proceedings Twelfth Conference on Grea Lakes Research, May 5-7, 1969, University o Michigan, Ann Arbor: International Association for Great Lakes Research, p 734-741, 1969. 8 p, fig, 7 ref.

Descriptors: *Self-purification, *Water pollution control, *Lake Ontario, *Water circulation, Path of pollutants, Nutrients, Algae, Stratified flow Mixing, Flow, Model studies, Mathematical models, Great Lakes, Thermal stratification.
Identifiers: Removal time (Pollutants).

A model is developed to calculate the removal time of a conservative contaminant from a lake, taking summer stratification into account. The basic as-

sumptions of the model were compared with conditions actually occurring in Lake Ontario, and it is shown that stratification has little effect on the calculated removal time. The results are extrapolated to the behavior of non-conservative parameters. A sharp reduction in the rate of input of nutrients could result in a marked decrease in algal growth within a year after such measures become effective. (See also W71-05561) (Knapp-USGS)
W71-05878

ORGANIZING WATER POLLUTION CONTROL: THE SCOPE AND STRUCTURE OF RIVER BASIN AUTHORITIES,
Harvard Univ., Cambridge, Mass.
For primary bibliographic entry see Field 06F.
W71-05936

WATER POLLUTION CONTROL, RIVER BASIN AUTHORITIES AND ECONOMIC INCENTIVES: SOME CURRENT POLICY ISSUES,
Bowdoin Coll., Brunswick, Maine; and Wisconsin Univ., Madison.
For primary bibliographic entry see Field 06B.
W71-05937

OPTIMUM INVESTMENT IN WATER POLLUTION CONTROL,
Federal Water Pollution Control Administration, Arlington, Va.
For primary bibliographic entry see Field 06B.
W71-05938

A MODEL OF PUBLIC DECISIONS ILLUSTRATED BY A WATER POLLUTION POLICY PROBLEM,
Resources for the Future Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W71-05939

75 YEARS OF IMPROVEMENT IN WATER SUPPLY QUALITY,
American Water Works Association, New York.
For primary bibliographic entry see Field 06E.
W71-05943

URBAN PLANNING ASPECTS OF WATER POLLUTION CONTROL,
Columbia Univ., New York.
For primary bibliographic entry see Field 06B.
W71-05944

PESTICIDE RESIDUES AND ENVIRONMENTAL ECONOMICS,
Florida Univ., Gainesville; and Missouri Univ., Columbia.
W. F. Edwards, Max R. Langham, and J. C. Headley.
Natural Resources Journal, Vol 10, No 4, p 719-741, October 1970.

Descriptors: *Pesticide residues, Cost-benefit analysis, Social welfare, Regression analysis, Marginal cost, Marginal value, Productivity.
Identifiers: *Environmental economics, Externalities, Objective function, Property rights, Consumer surplus, Producer surplus.

The relationship between externalities and public policy in environmental quality management are considered. Disputes created by externalities can be settled through participatory decision-making but policy decisions reached in this way do not represent social costs and benefits precisely. If social costs and benefits are the major determinants of public policy then better measures of social welfare are necessary. The author presents two studies which provide empirical measures for pesticide policy-making. The first study measures the productivity of pesticides for U.S. agriculture as a whole. The second study tries to include externalities in a policy decision model to determine which of two pesticide policies is optimal from a social welfare point of view. The measure of social welfare used in this study consisted of consumers' surplus plus producers' surplus modified for externalities. This model is capable of including reduction in both air and water quality and is relevant to water studies concerned with the role of non-market effects in water quality management. (Siegenthaler-Rutgers)
W71-05951

THE ROLE OF INCENTIVES, PENALTIES, AND REWARDS IN ATTAINING EFFECTIVE POLICY,
Brookings Institution, Washington, D.C.
For primary bibliographic entry see Field 06B.
W71-05959

O'HEARN V TOWN OF ADAMS (DAMAGES FOR OVERFLOW OF SEWAGE).
For primary bibliographic entry see Field 06E.
W71-05967

ALDRIN: REMOVAL FROM LAKE WATER BY FLOCCULENT BACTERIA,
Ohio State Univ., Columbus. Dept. of Microbial and Cellular Biology.
Walter O. Leshniowsky, Patrick R. Dugan, Robert M. Pfister, James I. Frea, and Chester I. Randles.
American Association for the Advancement of Science, Vol 169, p 993-995, 1970. 1 fig, 22 ref.

Descriptors: *Aldrin, *Chlorinated hydrocarbon pesticide, *Flocculation, *Bacteria, Lake Erie, Adsorption, Colloids, Sediments, Diatoms, Detritus, Suspended load, Insecticides, Silts, Pesticides, Lakes.
Identifiers: *Floc forming bacteria, Inorganic particles, Microparticulates, Flavobacterium, Protaminobacter, Bacillus.

Studies of chlorinated hydrocarbon insecticides in a water column indicated that floc-forming bacteria isolated from Lake Erie adsorb and concentrate aldrin from colloidal dispersion and the subsequent settling of the bacterial flocs remove aldrin from the water phase. One bacterium was an orange-red pigmented gram-negative rod, tentatively identified as either a Flavobacterium or Protaminobacter. The other was a gram-positive species of Bacillus. Gram-negative bacteria adsorption is slower as compared to the gram-positive, with considerable concentrating effect. Contemporary sediments forming in Lake Erie contain aldrin and could adsorb more. The presence of both aldrin and dieldrin was detected by both gas chromatography and microcoulometry. Electron microscopic examination of Lake Erie contemporary sediments show that these sediments consist of a conglomerate floc of bacteria, diatoms, and inorganic and detrital particles. Flocculent bacteria also adsorb microparticulates, and this adsorption capacity represents a mechanism for sediment formation, and for the removal of suspended particles including aldrin from the water column. (Jones-Wisconsin)
W71-06000

JAMAICA BAY AND KENNEDY AIRPORT: A MULTIDISCIPLINARY ENVIRONMENTAL STUDY.
Jamaica Bay Environmental Study Group, N.Y.
For primary bibliographic entry see Field 06G.
W71-06045

WATER POLLUTION: OBSERVATIONS ON CONNECTICUT'S RESPONSE,
Edward W. Manasse, and Edward Kiel.
Connecticut Law Review, Vol 3, No 1, p 206-224, 1970. 19 p, 82 ref.

Descriptors: *Connecticut, *Pollution abatement, *Water quality control, *Legislation, Water pollution control, Massachusetts, Colorado, Pennsylvania, Water conservation, Water resources, Impaired water quality, Financing, Cost sharing, Damages, Remedies, Industrial wastes, Municipal wastes, Public health, State governments, Local governments, Administrative agencies, Judicial decisions, Legal aspects.

In order to assess the Connecticut Clean Waters Act of 1967, this article compares it with the traditional common law response to the pollution problem, the Massachusetts approach, and the legislative answers preferred by Colorado and Pennsylvania. It is concluded that these other approaches to the problem are inadequate in that they are compatible with continued pollution of water, lack sufficient sanctioning power, and lack provision for funding of pollution abatement. The Clean Waters Act is a model for the achievement of successful pollution abatement. The future of water resources in Connecticut has been given a large thrust forward, due in large part to: the newly created enforcement methods, the threat of potentially severe economic penalties, and the ability to order corrective action to abate what may appear to be a possible future source of pollution. An evaluation of the effect and future potential of the Act at the actual operating level is made. The Water Resources Commission has been active in its supervision of water pollution abatement. If its present level of activity is maintained, Connecticut may conceivably have clean waters by its target date of 1974. (Smiljanich-Florida)
W71-06047

THE ENVIRONMENTAL LAWSUIT: TRADITIONAL DOCTRINES AND EVOLVING THEORIES TO CONTROL POLLUTION,
Robert R. Lohrmann.
Wayne Law Review, Vol 16, No 3, p 1085-1135, 1970. 51 p, 270 ref.

Descriptors: *Water pollution control, *Pollution abatement, *Legal aspects, *Remedies, Judicial decisions, Legislation, Environment, Ecology, Legal aspects, Administration, Federal government, State governments, Governments, Regulation, Environmental effects, Environmental sanitation, Balance of nature, Natural resources, Federal jurisdiction, State jurisdication, Political aspects, Adjudication procedure.
Identifiers: Constitutional aspects.

Dealing with environmental lawsuits in general, this article first examines the procedural considerations involved, including: standing to sue in the federal and state courts, class actions, and burden of proof. Next, tort remedies are considered and compared to determine their ultimate values in environmental litigation. These include: nuisance, both public and private; trespass; strict liability; and negligence. The public trust doctrine is examined to determine its possible use in environmental lawsuits. Statutory rights created by both federal and state legislation are interpreted and evaluated. Constitutional rights to a healthful environment are examined in light of certain recent state constitutional provisions, as well as those already existing as penumbral rights under the United States Constitution. The author contends that environmental lawsuits play two significant roles: (1) the development of a body of case law which will indicate to legislators the areas of concern and the legal issues, and (2) the regulation of localized pollution. (Robinson-Florida)
W71-06048

CONTROL OF RELEASES OF RADIOACTIVITY TO THE ENVIRONMENT.
Atomic Energy Commission, Washington, D.C.

Federal Register, Vol 35, No 63, Wednesday, April 1, 1970, p 5414-5416.

Descriptors: *Radioactive wastes, *Nuclear reactors, *Nuclear powerplants, *Administrative agencies, Federal government, Industrial wastes, Radiation, Public health, Environmental effects, Hazards, Water pollution sources, Nuclear energy,

Electric power industry, Electric power production, Nuclear wastes, Waste treatment, Waste water treatment, Treatment facilities, Effluents, Waste water (Pollution), Institutional constraints, Regulation, Adoption of practices, Permits.
Identifiers: *Administrative regulations.

In these proposed amendments to existing regulations, the Atomic Energy Commission would require licensees to maintain radiation levels below specified standards. Persons engaged in licensed activities would be required to make every reasonable effort to keep radiation exposure and effluent release in unrestricted areas as far below specified limits as practicable. Applicants for licenses must identify the design objectives and the means to be employed to keep radioactive effluent material as low as possible. Light-water-cooled power reactor licenses will include specifications requiring adherence to effluent-control procedures and the maintenance and use of waste treatment equipment. Semiannual reports detailing the quantity of radioactive material released would be filed and after compilation released to the public. In proposing these amendments the Commission notes that: (1) AEC standards are based on Federal Radiation Council guidelines; (2) an increase in the size and number of reactors may be expected; (3) there is a recognized need for flexibility in the operation of nuclear plants; (4) monitoring activities continue to be important; and (5) research and development by the nuclear power industry will continue to be encouraged. (Earl-Florida)
W71-06051

VIEWS OF THE GOVERNORS ON TAX INCENTIVES AND EFFLUENT CHARGES (WATER POLLUTION CONTROL AND ABATEMENT).

House Comm on Government Operations, H Rep No 1330, 89th Cong, 2d Sess 1966. 75 p.

Descriptors: *Pollution abatement, *Industries, *Federal government, *State governments, Water pollution, Water pollution control, Public health, Water quality, Taxes, Effluents, Sewage effluents, Legal aspects.
Identifiers: *Tax incentives, *Effluent charges.

The House Committee on Government Operations conducted a study to determine methods for preventing and controlling water pollution. The views of the nation's state governors were solicited to determine the efficacy of tax incentives and effluent charges to achieve pollution abatement. The report reaches several conclusions. Tax incentives to encourage pollution abatement are not extensively used by the states although legislation in the area is being considered. Prior experience indicates that industry frequently fails to utilize tax incentive programs for pollution abatement. Most states support federal tax incentive programs for pollution abatement, and no conflict between such a federal program and similar state programs was observed. However, those opposing tax incentives suggested that industry should not be paid for complying with pollution law. No state currently utilizes effluent charges to control pollution. Most governors opposed federal effluent charges as a license to pollute and because of anticipated difficulty in administration. (Hart-Florida)
W71-06052

WATER POLLUTION PROBLEMS AND CONTROL PROGRAMS IN MICHIGAN'S PORTION OF THE GREAT LAKES.
Michigan Water Resources Commission, Lansing.

Excerpted from Clean Water...It's up to you. Typescript, 10 p.

Descriptors: *Michigan, *Great Lakes, *Water pollution control, *Water pollution sources, Water quality control, Water resources development, Pollution abatement, Lake Erie, Lake Huron, Lake Michigan, Lake Superior, Waste treatment, Administrative agencies, State governments, Federal government, Thermal pollution, Storm runoff, Oil, Ships, Irrigation effects, Runoff, Acid mine water, Sediments, Estuarine environment, Eutrophication.

A survey of water quality conditions of the Great Lakes surrounding Michigan shows that the lakes are of high quality and relatively unpolluted, with the exception of Lake Erie and portions of Lake Michigan. The Michigan Water Resources Commission is effective in anti-pollution efforts, especially through voluntary pollution abatement. The Commission specifies restrictions on waste discharges, and a deadline is established for meeting these limitations. Where voluntary compliance is ineffective, the Commission does not hesitate in seeking court action or pursuing the penalty provisions of the law. A survey is made of various enforcement conferences called by the Secretary of the Interior. The top priority pollution problems requiring development of improved control techniques include: (1) thermal pollution from power plants and industry; (2) storm water overflows which bypass sewage treatment plants; (3) oil spills; (4) vessel pollution in harbors and heavily used waterways; (5) irrigation pollution resulting in concentrated salts and minerals; (6) agricultural runoff; (7) acid mine drainage; (8) increase in sediment volumes; (9) destruction of estuaries by pollution, dredging, and filling; and (10) eutrophication by addition of excessive nutrients. A brief survey of waste treatment methods is included. (Smiljanich-Florida)
W71-06053

WATER QUALITY STANDARDS.
Department of the Interior, Washington, D.C.

Code of Federal Regulations, Title 18, Chap V, part 620, 1970. 10 p.

Descriptors: *Water quality control, *Standards, *State governments, *Pollution abatement, Water Quality Act, Water pollution control, Federal government, Administrative agencies, Regulation, Administration, Water policy, Adoption of practices, Legal aspects, Legislation, Public health, District of Columbia, United States, Water resources development, Governments, Federal jurisdiction.
Identifiers: *Federal Water Pollution Control Act.

Pursuant to the Federal Water Pollution Control Act, the Secretary of the Interior herein identifies and describes those state-adopted water quality standards which meet the criteria of the federal act. The water quality standards consist of state water quality criteria and a plan for the enforcement and implementation of such criteria. The Secretary must determine if such standards will protect the public health or welfare, enhance the quality of water and serve the purposes of the federal act. The standards thus qualifying are available for inspection at offices of the Federal Water Pollution Control Administration. Each state, plus the District of Columbia and territories of the United States, is listed with reference to its approved water quality standards. (Smiljanich-Florida)
W71-06054

THE ENFORCEMENT PHASE OF POLLUTION ABATEMENT: THE ROLE OF THE ARMY ENGINEERS,
Gunnar K. Mykland.
Water and Sewage Works, Vol 117, No 6, p 213-216, June 1970.

Descriptors: *Pollution abatement, *Water pollution, *Administrative agencies, *Water pollution control, Legislation, Legal aspects, Judicial decisions, Rivers and Harbors Act, Water Quality Act, Federal government, Administrative decisions, Governments, Administration, Regulation, Abatement, Non-structural alternatives.

The Army Corps of Engineers has primary responsibility for enforcement of federal anti-pollution legislation. During 1969, the Corps of Engineers reported an average of one violation per day to the Department of Justice for prosecution. The various examples of older legislation utilized to abate pollution are discussed in this article, including the Rivers and Harbors Act and the Oil Pollution Act of 1924. It is observed that the primary object of the earlier legislation was to protect navigation from obstruction and injury, and hence enforcement was focused on this purpose. Conversely, the article observes that present enforcement emphasizes protection of the general public interest rather than protection of navigation. Two problems of enforcement are: (1) difficulty in securing sufficient evidence to justify prosecution and (2) insufficient personnel to police the numerous and widely dispersed areas. Pollution abatement is said to depend upon increased public concern and familiarization with available legislation. Recent legislation examined includes: (1) the Oil Pollution Act of 1961; (2) the Fish and Wildlife Coordination Act; (3) the National Environmental Policy Act; and (4) the Water Quality Improvement Act. A number of landmark court decisions are also noted. (Hart-Florida)
W71-06055

SIMULATION OF A WATER RESOURCES SYSTEM, FINAL REPORT,
Washington Univ., Seattle. Fisheries Research Inst.
William H. Lenarz.
University of Washington Fisheries Research Institute, February 5, 1969. 10 p, 1 fig, 11 refs.
OWRR Project A-003-Wash (1).

Descriptors: *Model studies, *Computer models, *Abstracts, *Computer programs, Sampling, Data collection, Data processing, River forecasting, Anadromous fish, Salmon, River flow, Zooplankton, Fish management, Fish harvest, Washington.
Identifiers: Green-Duwamish Rivers of Washington, Duwamish Estuary of Washington, Elliott Bay of Washington.

Computer analysis and modeling using field data from automatic water-quality monitors was tested and found to provide sufficient information for evaluation of general trends affecting fish populations, such as dissolved oxygen, temperature, and pH. Other projects were undertaken for which data was collected and analyzed and computer programs written. A series of models, simulating population dynamics in freshwater zooplankton, analysis of problems of determining maximum sustained yield of a mixture of fish stocks, a simulation of anadromous fish migration, and a simulated river flow model for which a flow diagram is given, were developed. The Green-Duwamish Rivers and the Duwamish Estuary-Elliott Bay area were used in the model studies. A list of publications resulting from this research is appended to the report. (Yensen - Arizona)
W71-06066

WATER QUALITY TELEMETRY FINAL PROGRESS REPORT,
Utah Water Research Lab., Logan.
Durad S. Woffinden, and Allen D. Kartchner.
Utah Water Research Laboratory Report PRWG 3-2 College of Engineering, Utah State University, August 1969. 42 p, 29 fig, 2 tab. FWPCA Grant No WPD 179-02-68.

Descriptors: *Water quality control, *Telemetry, *Remote sensing, *Design, *Engineering, Water measurement, Data collections, Data transmission, Sampling, Instrumentation, Electronic equipment, Construction costs, Cost analysis, Analytical techniques, Methodology, Water properties.

A battery-powered radio-telemetry method for monitoring water quality has been developed by the Utah Water Research Laboratory. Overcoming the major difficulty of large, unwieldy size, the Utah Water Research Laboratory's unit is small enough to be hand-carried, being housed in a 15 in. x 15 in. x 14 in. fiberglass case. Photographs illustrate the unit. A technical description is given, in-

cluding circuitry, block diagrams of the field station and base station, transmitter receiver control and power interconnections, timer operation, and station reply techniques. Measurements of dissolved oxygen, temperature, pH, and conductivity can be made automatically, and the circuits for each of these measuring devices are outlined. A table analyzes costs of both field and base stations, including assembly time and labor costs. (Yensen - Arizona)
W71-06069

ONE-DIMENSIONAL OPEN CHANNEL HEAT DISPERSION,
Tennessee Univ., Knoxville.
David Chung-Shung Chou.
MS Thesis, University of Tennessee, June 1969. 53 p, 35 ref, 6 tab, 7 fig.

Descriptors: *Dispersion, *Heat transfer, *Temperature, *Mathematical models, Hydraulic models, Energy transfer, Convection, Diffusion, Mixing, Water pollution, Channel flow, Open channel flow, Hydraulics.
Identifiers: Heat dispersion modeling, Heat dispersion coefficients.

A one-dimensional mathematical model which describes the turbulent mixing process under steady uniform flow conditions has been developed for predicting the longitudinal heat dispersion coefficient in a laboratory flume. Heated water was used as the tracer in these experiments. It was found that a solution to the general dispersion equation is applicable to describe the turbulent mixing process involved with heat dispersion for a one-dimensional open channel flow. A set of heat dispersion coefficients in the laboratory flume was obtained under five different uniform steady flow conditions. The experimental results showed that the longitudinal heat dispersion coefficient, DL, increases the depth of flow decrease. (Novotny-Vanderbilt)
W71-06085

COOLING WATER RESOURCES AND POWER GENERATION,
Southern California Edison Co., Los Angeles.
B. R. Laverty, and P. J. West.
Presented at National Water Resource Conference, ASCE, Phoenix, Arizona, January 1971. Typescript, 21 p.

Descriptors: *Cooling water, *Thermal powerplants, Thermal pollution, Temperature, California, Thermal power, Electric power, Electric power industry, Cooling, Water resources, Colorado River, Water supply.

Sources of cooling water are the ocean, reclaimed waste water, and fresh water. The problems connected with the use of water from these sources are discussed, based on trends in power generation needs in the future. Different cooling systems in stream power plants are described (once-through cooling, evaporative cooling towers, ponds, etc.). In southern California, a particular attention has to be paid to the fresh water cooling resources, and problems connected with it are discussed in the paper. It has been predicted by Edison Company that the cooling water demand by the company will be 70 times greater in the year 2010 than in 1970. It has been found that the water will have to be imported from other regions in order to satisfy such great amounts of cooling water. Also, the future powerplants will have to be located outside of southern California. The sea water is also considered as a main future cooling water resource. (Novotny-Vanderbilt)
W71-06091

A STUDY OF THE BEHAVIOR OF OIL SPILLS IN THE ARCTIC,
Coast Guard, Washington, D.C. Applied Technology Div.
For primary bibliographic entry see Field 05B.
W71-06101

STUDY OF EQUIPMENT AND METHODS FOR REMOVING OR DISPERSING OIL FROM OPEN WATERS,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
C. H. Henager, P. C. Walkup, J. R. Blacklaw, J. D. Smith, and L. M. Polentz.
Available from NTIS as AD-716 792, $3.00 in paper copy, $0.95 in microfiche. Report No CR71-001, August 1970. 239 p, 47 fig, 15 tab, 50 ref. Navy Contract N62399-70-C-0008.
Identifiers: *Water pollution, *Oils, Costs, Petroleum, Removal, Combustion, Toxicity, Oceans, Lakes, *Oil pollution, *Water pollution control, *Water pollution control equipment, Skimmers, Booms equipment, *Dispersants, *Emulsification.

A cost effectiveness analysis was performed for equipment, materials and techniques applicable to the removal or dispersal of spilled oil from U.S. Navy AO and AOG vessels on open waters. Effectiveness parameters included oil product types (JP-5, Distillate Fuel, Navy Special and Bunker C), expected spill locations (3 and 12 miles from shore) and size of expected spill (10 tons, 1000 tons and 25,000 tons). Criteria for evaluation of systems under the above parameter situations, formulated for presently available equipment and materials, include: completeness of oil removal; rate of removal; hazard and pollution; use in limited access areas; sensitivity to expected environmental factors; sensitivity to temperature extremes; toxicity to marine life and system avilability. Cost effectiveness was determined using the 3 spill sizes and checked for spill frequency. The three most cost effective systems for the spectrum of spill sizes were found to be burning of the oil, dispersing the spilled oil and mechanical skimming. Considering system applicability to various products and the practical requirements of rate of removal for massive spills, the most practical universal system with a favorable cost effectiveness ratio was found to be dispersing. This is followed by dispersing plus a containment boom. Burning agents applied directly to the spill was judged to the third system based on its favorable cost effectiveness but limited applicability to oil types and permissible burning circumstances.
W71-06106

WATER QUALITY MANAGEMENT PROBLEMS IN ARID REGIONS.
Robert S. Kerr Water Research Center, Ada, Okla. Treatment and Control Research Program.

Available from NTIS as PB-198 125, $3.00 in paper copy, $0.95 in microfiche. James P. Law, Jr., and Jack L. Witherow, Editors. Federal Water Quality Administration Water Pollution Control Research Series 13030 DYY 6/69, October 1970. 105 p. FWQA Program 13030 DYY.

Descriptors: *Conferences, *Water quality, *Water pollution sources, *Water pollution control, *Arid lands, Irrigation, Agriculture, Evaporation, Salinity, Farm wastes, Surface waters, Groundwater, Planning, Irrigation effects, Wastes, Nutrients.

An international conference entitled 'Arid Lands in a Changing World' sponsored by the American Association for the Advancement of Science Committee on Arid Lands and the University of Arizona, was held at Tucson in June, 1969. The Federal Water Quality Administration provided financial support for the conference and solicited papers to be presented in the Water Management and Salinity and Desalinization sessions. This report presents a selected group of the papers presented at those sessions which should benefit those concerned with water quality management problems in arid regions. The title of the papers included in this report are as follows: nitrate removal from agricultural waste water; the effects of salinity standards on irrigated agriculture in the Colorado River basin; problems of pollution of irrigation waters in arid regions; water quality requirements and re-use of waste water effluents; salinity control in return flow from irrigated areas--a demonstration project; water quality control problems in inland sinks; natural pollution in arid land waters; distillation of waste waters: a water resource for arid regions; and animal waste runoff--a major water quality challenge. (See also W71-06112 thru W71-06114) (Woodard-USGS)
W71-06111

FRONTIERS IN CONSERVATION.
For primary bibliographic entry see Field 04C.
W71-06129

WATER QUALITY MODELING AND PREDICTION,
Kansas Water Resources Research Inst., Manhattan.
E. S. Lee, L. E. Erickson, and L. T. Fan.
Available from NTIS as PB-198 127, $3.00 in paper copy, $0.95 in microfiche. KWRRI, Kansas Water Resource Research Institute, Contribution No 52, January 1971. 78 p, 9 tab, 21 fig, 24 ref, append. OWRR Project B-015-KAN (2).

Descriptors: Biochemical oxygen demand, *Water quality control, *Model studies, *Forecasting, Mathematical models, Water pollution control, Dispersion, Dissolved oxygen.
Identifiers: Parameter estimation, Axial dispersion, Quasilinearization, Invariant imbedding, Nonlinear filtering.

The recently developed modeling and forecasting techniques such as quasilinearization and invariant imbedding are applied to the modeling of water quality systems. Due to the fast convergence rate and the sequential nature of the estimation scheme, a large amount of computer time and computer memory can be saved. Furthermore, these approaches form an effective forecasting technique for the prediction of pollutant concentration. The dispersion model with the consideration of axial mixing is used. By properly adjusting the axial diffusion coefficient, the dispersion model can represent streams with any degree of mixing. A water stream with intermediate reservoirs, and with waste discharges and water intakes along the stream, is represented by a system of second order differential equations. These equations are obtained by dividing the stream into different segments. An analytical solution is obtained for this system of equations to predict the BOD and DO concentrations. Based on this model, simulation study is also carried out to investigate the influence of the various parameters on the BOD and DO profiles.
W71-06186

PHYSICAL PROPERTIES AND PROCESSING CHARACTERISTICS OF MACROPHYTES AS RELATED TO MECHANICAL HARVESTING,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 04A.
W71-06188

MARGINAL COSTS OF ALTERNATIVE LEVELS OF WATER QUALITY IN THE UPPER MISSISSIPPI RIVER,
Minnesota Univ., St. Paul.
Robert Lewis Lewis.
Water Resources Research Center, Bulletin 25, University of Minnesota, Minneapolis, Minnesota, September 1970. 59 p, 12 fig, 6 tab. OWRR Project A-019-MINN (2).

Descriptors: *Water quality, *Marginal costs, Management, Waste treatment, Treatment facilities, Dissolved oxygen, Cost analysis.
Identifiers: *Treatment expenditures, Analytic framework, Environmental problems, Upper Mississippi River, Twin Cities.

The purpose of this study is to identify the physical, institutional and economic interrelationships that affect and are affected by the quality of the water in the Mississippi River in the Twin Cities area. The

hypothesis tested in the thesis is that a cost minimizing management plan can be devised which will maintain the current dissolved oxygen (DO) river standard in the study area in a manner that is both physically and economically feasible under exisitng conditions. (A management plan is assumed to be economically feasible if the increase in the total annual cost of treatment does not exceed 10% of the present annual expenditure.) If the hypothesis is accepted, then the Sewer Service Board could maintain the DO river standard at a moderate increase in annual treatment expenditure by providing a more efficient allocation of treatment among the five treatment plants. The objectives of the study include: (1) identify the physical, institutional, and economic conditions related to water quality; (2) propose an analytical framework for combining the physical properties of the river with costs of treatment; (3) determine the highest possible DO river standard feasible with existing treatment facilities during summer low flows; (4) test hypothesis that minimum cost management scheme can be found which will maintain the current DO river standard in a manner both physically and economically feasible under existing conditions. It is concluded that the change in the institutional structure adopted by the Minnesota League will lead to a more efficient allocation of treatment expenditures at the five treatment plants. (Wray-Chicago)
W71-06191

IMPLICATIONS OF WATER QUALITY LAWS FOR THE FEEDLOT INDUSTRY,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
Ron E. Shaffer, and Daniel E. Badger.
Oklahoma Current Farm Economics, March 1970, Vol 43, No 1, p 3-11. 2 tab, 19 ref.

Descriptors: *Water pollution control, *Pollution abatement, *Water management (Applied), *Water Quality Act, *Environmental effects, Lagoons, Water pollution effects, Waste disposal, Cost sharing, Legal aspects, Social aspects, Fertilizers, Benefits, Arid lands, Dry seasons, Waste dilutions, Stabilization, Dissolved solids, Oklahoma, Texas, Return (Monetary), Profit, Water utilization, Productivity, Streams, Legislation, Cattle, Water treatment, Waste treatment.
Identifiers: *Quality alteration, *Trade off, *Feed lot industry, *Beef feeding industry, *Feed Yards Act.

Agricultural water users historically considered the amount of wastes and impurities that could be discharged; recent emphasis is to keep pollutants from streams. Feedlot operators must integrate and coordinate the total production process to efficiently use resources for a profitable return. They must know what legal and social requirements they have in environmental protection through water management. Large-scale operations in Texas and Oklahoma, with up to 40,000 head capacity, predominate the beeffeeding industry. The Water Quality Act and Feed Yards Act require elimination of interstate water pollution and water-resource enchancement. Oklahoma requires feedlot licensees to provide reasonable waste disposal and drainage to avoid pollution. Feedlot runoff is discussed in terms of removing undesirable solids by stabilization lagoons and dilution. These methods present special problems in dry seasons and in arid lands. Waste disposal of manure as fertilize sales is not economical, but social and legal benefits of pollution-free rivers are high. Cost sharing waste control projects are outlined. Future feedlot locations must consider access to waste disposal as well as beef markets. Environmental quality is a dimension new to the industry, which will be developed when society can tradeoff between production efficiency and environment, or develop cost-sharing programs. (Popkin-Arizona)
W71-06222

SUSQUEHANNA RIVER BASIN STUDY (SUMMARY),
For primary bibliographic entry see Field 06B.
W71-06227

YORK RIVER BASIN COMPREHENSIVE WATER RESOURCES PLAN-VOLUME 1, INTRODUCTION.
Virginia Dept. of Conservation and Economic Development, Richmond. Div. of Water Resources.
For primary bibliographic entry see Field 06B.
W71-06230

INDUCED AIR MIXING OF LARGE BODIES OF POLLUTED WATER,
Maine Univ., Orono. Dept. of Chemical Engineering.
Stefan A. Zieminski, and Raymond C. Whittemore.
Copy available from GPO Sup Doc as: I67.13/4: 160800WP, 11/70, $.0.60; microfiche from NTIS as PB-198 220, $0.95. EPA-WBO Report No 16080 DWP, Nov 1970. 46 p, 32 fig, 5 tab, 26 ref.

Descriptors: *Aeration, *Water quality control, *Air entrainment, Coalescence bubbles, Mixing, Diffusion, Tracers.
Identifiers: Air plume, Energy input.

Induced air mixing of large bodies of water was investigated. The objective was to conduct a pilot-scale study to estimate the effects of variables such as the air flow rate, geometry of the body of water, energy input, size of air bubbles, and the pumping capacity of the air plume on the time of mixing. The latter was defined as the time required to reach 90% of the equilibrium concentration of the KCl tracer. In the study emphasis was put on the direction and relative magnitudes of the variables in order to obtain guidelines for large-scale investigation. Considerable time was spent on the development of the various experimental techniques. The tests were conducted in a plexiglas tank of 180 gallons capacity. It is stressed that the induced air system was investigated only from the viewpoint of its mixing performance. Its effect on aquatic life was not considered.
W71-06245

DEVELOPMENT OF PHOSPHATE-FREE HOME LAUNDRY DETERGENTS,
IIT Research Inst., Chicago, Ill.
Karl A. Roseman, and Warner M. Linfield.
Copy available from GPO Sup Doc as EPA-WQO Report No 16080 DVF, December 1970, $1.00; microfiche from NTIS as PB-198 222, $0.95. 103 p, 4 tab, 10 ref. EPA-WQO Contract 14-12-575.

Descriptors: *Detergents, *Algal control, *Formulation, *Surfactants, *Eutrophication, Linear alkylate sulfonates, Chelation, Phosphates, Organic compounds, Water pollution control.
Identifiers: Phosphate-free detergents, Trisodium nitrilotriacetate, Sodium citrate.

Basic studies were performed towards the development of phosphate-free home laundry detergents. Five surfactants were synthesized with the idea that they might possess hard ion chelating properties. The cleaning abilities of these materials were compared to the widely used linear alkylbenzene sulfonate as incorporated into the same formulations. The detergent compositions contained 2% carboxymethylcellulose and the silicate content was varied. Sodium acetate and sodium carbonate were investigated as possible reservoirs of alkalinity. Surfactant compatibility with sodium chloride and sodium sulfate was examined. Other additives included trisodium nitrilotriacetate and sodium citrate at moderate levels. Fifteen detergent formulations were screened and the results leave little doubt that acceptable phosphate-free home laundry detergents can be developed.
W71-06247

INVESTIGATION OF MEANS FOR CONTROLLED SELF-DESTRUCTION OF PESTICIDES,
Aerojet-General Corp., El Monte, Calif. Environmental Systems Div.
Keith H. Sweeny, and James R. Fischer.
Copy available from GPO Sup Doc as No 1604
ELO, June 1970, $1.25; microfiche from NTIS
PB-198 224, $0.95. EPA-WQO Report No 1604
ELO, June 1970. 128 p, 7 fig, 3 tab, 64 ref. EP
WQO Contract No. 14-12-596.

Descriptors: *Pesticide removal, *DDT, *Reduc
tion (Chemical), Chlorinated hydrocarbon pest
cides, Soil environment, Waste water treatmen
Pesticide residues.
Identifiers: *Pesticide degradation
Polychlorinatedbiphenyls, PCB, DDE.

Laboratory studies demonstrated the feasibility c
controlled destruction of chlorinated pesticide
such as DDT. The concept comprised (1) means t
degrade DDT to a harmless form, and (2) method
to delay the reaction for given pest-control action
Chemical methods for degrading DDT wer
screened and reduction was selected as the mos
promising technique. Destruction of DDT, withou
forming DDE as a product was demonstrated b
mildly acidic reduction with zinc powder. The prin
cipal product is bis (p-chlorophenyl)ethane, DD
with all three aliphatic chlorines removed;
material stated to be 'void of the neurotoxic effect
of DDT.' Catalysis of the reaction resulted in
complete destruction of DDT in 1 hr at 25 degree
C and conversion to bis (chlorophenyl)ethane in 4
8 hrs. Catalyzed aluminum or iron reduction o
DDT produced tetra (p-chlorophenyl)
tetrachlorobutane, reportedly lipoid insoluble
Reductive degradation of dieldrin, endrin, aldrin
chlordane, heptachlor, toxaphene, and selecte
polychlorinated biphenyls was also shown. A 90%
destruction of DDT in laboratory soil was shown in
4 days by this technique. Degradation of DDT in
water was demonstrated also, a 421 mg/l suspen
sion being reduced to 1 ppm after 1 hr reaction a
75 degrees C. Reaction delay can be achieved with
wax or silyl coatings which are slowly dissolved or
eroded. Coatings were produced which stopped
zinc-acid reaction.
W71-06249

INDUCED HYPOLIMNION AERATION FOR WATER QUALITY IMPROVEMENT OF POWER RELEASES,
Robert S. Kerr Water Research Center. Ada, Okla.
Lowell E. Leach, William R. Duffer, and Curtis C.
Harlin, Jr.
Copy available from GPO Sup Doc as Report No
16080, October 1970, $0.50; microfiche from
NTIS as PB-198 226, $0.95. Report No 16080, Oc-
tober 1970. 32 p, 15 fig, 2 tab, 21 ref.

Descriptors: *Aeration, *Thermal stratification,
*Impoundments, *Hypolimnion, Dissolved oxygen,
Mixing, Oxygenation, Air entrainment, Ther-
mocline, Epilimnion.
Identifiers: *Water quality control, *Induced aera-
tion, *Reservoir destratification, Air distribution
system, Oxygenation efficiency, Power release
aeration.

Conventional hydraulic structures in most dams
withdraw low flow and power releases from the
poor quality hypolimnion waters during summer
stratification resulting in serious degradation of
long reaches of streams below dams. Induced aera-
tion of hypolimnion waters during summer stratifi-
cation has great potential in water quality manage-
ment of power releases, low flow releases, and
limited volumes of impoundments without costly
modification of existing outlet works. Hypolimnion
aeration research on power discharge quality im-
provement was conducted at Eufaula Reservoir in
southeastern Oklahoma during the summer of
1968. Dissolved oxygen transfer efficiency of the
aeration system ranged from 1.8 to 3.0 pounds of
dissolved oxygen per horsepower-hour of expended
energy resulting in an operating cost of 4.10 to 6.25
dollars per 1,000 pounds of oxygen incorporated
into the power releases. Additional research for
development and optimization of the induced aera-
tion system is discussed. (Leach-EPA-WQO)
W71-06251

ARBONATE BONDING OF COAL REFUSE,
lack, Sivalls and Bryson, Inc., Pittsburgh, Pa. Applied Technology Div.
aul J. LaRosa, James A. Karnavas, and Eugene A. elczarski.
opy available from GPO Sup Doc as I67.13/4: 4010FOA 02/71, $0.60; microfiche from NTIS as B-198 230, $0.95. EPA-WQO Report 14010, OA, Feb 1971. 44 p, 9 tab, 22 fig, append. EPA-VQO Grant 14010 FOA.

escriptors: *Acid mine water, *Coal mine waste, Calcium carbonate, *Sealants, Carbon dioxide, ollution abatement, Road construction, Water ollution control, *Binders.
lentifiers: *Carbonate bonding, *Coal refuse inder.

A laboratory study of the variables which affect the roperties of the carbonate bonded coal refuse has een made. The carbonate bonding process utilizng coal refuse as a fill material consists of mixing oal refuse with water and lime hydrate, compactng the mixture, and reacting it with a carbon-dioxde-rich gas to form a coherent structure bonded by matrix of calcite crystals. The resulting carbonate onded coal refuse can be used in road building or s a coal refuse pile sealant to minimize acid mine ater pollution. Four types of coal refuse were inestigated--a relatively unoxidized and highly oxdized bituminous coal refuse and a relatively unoxdized and highly oxidized anthracite coal refuse. It as found that compressive strengths of 2200 to 400 psi were obtained for the four types of coal efuse investigated using up to 12 percent lime ydrate and 9 to 15 percent water. In general, the ompressive strength of the carbonate bonded coal efuse increases with increasing lime hydrate conent, reaction time and carbon dioxide concentraion in the carbonate bonding reaction gas. The air nd water permeability of carbonate bonded coal efuse was found to be comparable to concrete. An pproximate cost comparison between carbonate onded coal refuse and other construction materils and techniques indicated that the carbonate onding process utilizing coal refuse is the least ost means available for coal refuse pile sealing and oad building. (LaRosa-Black, Sivalls and Bryson) W71-06256

VASTE REDUCTION IN FOOD CANNING PERATIONS,
National Canners Association Research Foundaion, Berkeley, Calif. Western Research Lab.
For primary bibliographic entry see Field 05D.
W71-06257

BSTRACT OF PROCEEDINGS, HAZARDOUS OLLUTING SUBSTANCES SYMPOSIUM: NNEX 1 TO STUDY ON CONTROL OF AZARDOUS POLLUTING SUBSTANCES, EPT. 14-16, 1970. NEW ORLEANS, LA.
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 05B.
W71-06270

ELAWARE RIVER BASIN COMM'N HEARNG TO EXPAND THE COMPREHENSIVE LAN.
For primary bibliographic entry see Field 06E.
W71-06274

EARING BY DELAWARE RIVER BASIN OMM'N TO EXPAND THE COMPREHENSIVE LAN.

ederal Register, Vol 35, No 2421, p 18.991, Dec 5, 1970. 1 p.

escriptors: *Interstate compacts, *Interstate ommissions, *Sewage treatment, *Administrative gencies, Administrative decisions, Cities, Sewage istricts, Local governments, Federal government, ennsylvania, Water sources, Wells.

The Delaware River Basin Commission published notice of hearings to amend the Comprehensive Plan. Proposed amendments to expand the Comprehensive Plan are: (1) a modification of the existing treatment plant in Haverford Township, Pennsylvania to remove 90 per cent of BOD5 from 5.4 million gallons per day of sewage flow prior to discharge in Darby Creek; and (2) utilization of two existing wells as emergency water sources for Bethelehem, Pennsylvania. (Hart-Florida)
W71-06275

CERTIFICATES OF FINANCIAL RESPONSIBILITY (OIL POLLUTION).
For primary bibliographic entry see Field 06E.
W71-06276

STATE WATER CONTROL LAW.
For primary bibliographic entry see Field 06E.
W71-06277

GOVERNMENTAL RESPONSIBILITY FOR WASTE MANAGEMENT IN URBAN REGIONS,
Richard T. Anderson.
Natural Resources Journal, Vol 10, No 4, p 668-686 (Oct 1970). 19 p, 1 tab, 30 ref.

Descriptors: *Wastes, *Integrated control measures, *Regional analysis, *Municipal wastes, Federal government, State governments, Local governments, Inter-agency cooperation, Institutional constraints, Political constraints, Interstate, Planning, Political aspects, Administration, Coordination, Decision making, Domestic wastes, Regions, Environmental sanitation, Waste disposal, Waste water disposal, Waste treatment, Non-structural alternatives.

The allocation of governmental waste management responsibility is analyzed in this article. Four premises are employed in the analysis: (1) waste management is a collective, public responsibility; (2) solid, liquid, and gaseous wastes are related; (3) the urban-waste problem is regional; and (4) intergovernmental action is required. The three issues examined are: (1) determination of environmental quality levels, costs, and benefits, (2) ascertainment of the most efficient managerial system; and (3) the respective roles of the federal, state, regional and local governments. Determining national environmental policy and providing a financial commitment to the policy is held to be the role of the federal government. The state roles are said to include policy development on a state level and the design and operation of waste-management programs in cooperation with local governments. The desirability and scope of regional authority in fulfilling state responsibilities is analyzed in the light of four criteria: (1) geography, (2) desirable levels of operational authority, (3) functional duties, and (4) metropolitan representation. Six alternative approaches to regional waste management are presented by the author. (Earl-Florida)
W71-06282

GRANTS FOR PREPARATION OF COMPREHENSIVE AREA PLANS FOR WATER AND SEWER SYSTEMS.
Department of Agriculture, Washington, D.C.
For primary bibliographic entry see Field 06A.
W71-06284

PLASTICS IN WATER AND SEWAGE CONTROL,
For primary bibliographic entry see Field 08G.
W71-06286

RUBBER TANKS AID SEWAGE FIGHT,
Jonathan Eberhart.
Sci News, Vol 94, No 5, p 115, Aug 3, 1968.

Descriptors: *Construction materials, *Construction costs, Storm runoff, Overflow.
Identifiers: *Storm overflows, Rubber storage containers, Washington, D.C.

In Washington D.C.'s Anacostia River, a new technique is being tried to eliminate pollution of the river caused by sewage overflows during severe rainstorms. This new method is less expensive than Chicago's underground sewer project which will cost almost $15 million for the pilot project and more than $2 billion for city-wide installation. In Washington, large rubber tanks will be anchored beneath the surface of the Anacostia. Stormwater and sewage overflow will be diverted to these tanks and stored there until the water has receded, and the tanks' contents can be pumped to the nearby sewage treatment plant.
W71-06290

WATER POLLUTION CONTROL. 5 BILLION DOLLARS TAB,
C. Laverty.
Rubber World, Vol 160, No 1, p 48-49, Apr 1969.

Descriptors: *Rubber, *Biocontrol, Water pollution control, Construction materials.
Identifiers: *Rubber storage containers, Rubber gates, Acid-resistant hose.

A summary is given of various uses of rubber for combatting water pollution. Chunks or strips of rubber compounds containing relatively insoluble organo-metallic compounds or alkanolamine salts of salicylanilides as toxicants are dropped into contaminated water for biocidal action lasting one year or more. Other antipollution methods employ: giant (100,000 gal) rubberized Pillow tanks, used as temporary storage for sewage overflow triggered by heavy rains; nylon-reinforced polychloroprene Fabridam rubber gates for storm control; and acid-resistant hose, for carrying pickle liquor to storage tanks for treatment and ultimate disposal in underground sandstone reservoir.
W71-06297

LAND USE FUNCTION IN WATER QUALITY MANAGEMENT,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 06B.
W71-06310

MODELING AND CONTROL OF THE POLLUTION OF WATER RESOURCES SYSTEMS VIA MULTILEVEL APPROACH,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Systems Engineering.
For primary bibliographic entry see Field 06A.
W71-06311

CHARACTERIZATION AND CONTROL OF COMBINED SEWER OVERFLOWS, SAN FRANCISCO,
For primary bibliographic entry see Field 08B.
W71-06326

MIDLAND DISTRICT CENTER.

Inst Public Health Engrs, Vol 67, Part 1, p 51-57, Jan 1968.

Descriptors: *Overflow, *Sewage treatment.
Identifiers: *Storm tank, Great Britain.

The reconstructed and extended Kidderminster Sewage Works will content with excess water runoff by passing the overflow through screens or by storing it in stormwater tanks. The tanks will contain underwater sludge scrapers. Flow will be diverted from the river until all the tanks are individually filled. The stored water will eventually be pumped out for treatment.
W71-06331

IT'S IN THE BAG.

Am City, Vol 84, No 4, p 88, Apr 1969.

Descriptors: *Storage tanks, Overflow, Storm runoff, Ohio.
Identifiers: *Rubber storage containers, Combined sewers, Storm tank.

The problem of stormwater overflows from combined sewers is being combatted in Sandusky, Ohio through the implementation of a plan which is much less costly than the common solution of sewer separation. The new system consists of rubberized storage reservoirs that trap the heavily-polluted 'first flush' of stormwater. When the storm ends, pumps transfer the stored stormwater to the treatment plant for processing along with the normal waste water. Costs, details, and a diagram of the system are included in the article.
W71-06332

WORK STARTS ON 11-MILE INTERCEPTOR TO SOLVE TORONTO'S SEWER PROBLEM.
For primary bibliographic entry see Field 08A.
W71-06337

STORMWATER OVERFLOW GETS BAGGED.

Eng News-Record, Vol 181, No 18, p 14, Oct 31, 1968.

Descriptors: *Construction equipment, *Construction costs, *Separation techniques, Overflow.
Identifiers: *Rubber storage containers.

The FWPCA is financing projects to install rubber stormwater storage bags at three locations: Washington's Anacostia River, Sandusky, Ohio at Lake Erie, and Cambridge, Md.'s Choptank River estuary. The bags will store stormwater overflow that normally flows untreated into rivers and lakes along with sanitary sewage, when flows exceed treatment plants' capacities during heavy rainfall. The Washington bags rest on the bottom of the Anacostia River offshore of the pumping plant. The plant will chop overflow solids before the water reaches the bags, and an aerator will suspend the solids. The solids come out with the stored water when it is pumped back into the sewers for treatment. These plans are considerably less costly than sewer separation which would cost an estimated $48 billion to accomplish throughout the United States.
W71-06341

STORAGE BLADDERS FOR SEWAGE.

Ind Water Eng, Vol 5, No 8, p 30, Aug 1968.

Descriptors: *Construction equipment, *Rubber, *Storage tanks, Storm runoff, Overflow.
Identifiers: *Rubber storage containers, *Anacostia River.

Two large 100,000 gallon tanks of nylon-impregnated rubber have been anchored in metal cradles on the bottom of the Anacostia River. During rainfall the tanks are used to hold overflow and later, when the water has receded, the tanks are emptied and their contents pumped easily to the sewage treatment plant. These tanks have also been used for holding fuel, water, oil, beer, and wine.
W71-06344

INTERNATIONAL BUILDING EXHIBITION - OLYMPIA LONDON 13-25 NOVEMBER 1969.
For primary bibliographic entry see Field 08A.
W71-06348

DRAINAGE AND TREATMENT.

Surveyor, Vol 82, No 3988, p 150, Nov 9, 1968. 1 fig.

Descriptors: *Piping, Pipes, *Linings, Drainage engineering, Drainage systems, Plastic pipes, Sewers.

This brief review of recent advances and contracts in drainage and treatment includes a description of a new continuous length land drainage piping made from rigid unplasticised PVC which can be laid by mole-ploughing with backfill fed into the trench via a hopper above the plough. Also described is a new inexpensive method for relining sewer pipes using a sectioned plastics pipe, and a contract for a new L1/2 million, mile-long trunk sewer.
W71-06351

COMBINED SEWER SOLUTION SOUGHT IN SANDUSKY FIELD DEMONSTRATION.
Water Sewage Works, Vol 116, No 10, p 386-387, Oct 1969.

Descriptors: *Overflow, *Construction materials, Storm runoff.
Identifiers: *Storm overflows, Rubber storage containers, Storm tank, Sandusky, Ohio.

The use of flexible rubber containers for off-shore underwater temporary storage of storm overflow from a combined sewer has been proposed for the Sandusky Bay area as the answer to its storm overflow problems. The containers are predicted to temporarily hold overflows equivalent to a one-year storm. When the plant can handle the excess, the contents of the containers are pumped back to the plant where the sewage is treated and piped into the bay.
W71-06352

STORM WATER STORAGE SCHEME.

Water Waste Treat, Vol 12, No 7, p 221, May/Jun 1969.

Descriptors: *Construction materials, *Storm runoff.
Identifiers: *Rubber storage containers, *Storm overflows, *Sandusky, Ohio, Storm sewage.

A pilot project to study the storage of storm sewage from combined sewers at Sandusky, Ohio, is described. Two 100,000 gallon collapsible fabric-reinforced rubber tanks have been installed on the bottom of Sandusky Bay; the tanks will fill by gravity and will temporarily store overflows equivalent to a 1-year storm on a small area. Subsequently the storm sewage will be pumped to the works for treatment and discharged to the bay between storms.
W71-06357

APPLIES EXISTING TECHNOLOGY FOR A CLEANER LAKE ERIE.

Am City, Vol 85, No 4, p 18, Apr 1970.

Descriptors: *Waste treatment, *Storage, Instrumentation, Storm runoff.
Identifiers: *Lake Erie, Monitoring system, Stormwater storage.

The Detroit Metropolitan Water Service is putting existing technology into effect to help decelerate the aging of Lake Erie. Proposed programs include: solids reduction by addition of mechanisms to the regional waste water plant, coliform removal through chlorination, phosphate reduction using pickle liquor from steel mills, waste oil and grease removal using oil skimmers, construction of phenol-removing systems, and installation of smokestack air cleaners to prevent air pollution. A monitoring system to reduce stormwater overflows is also being built to warn of approaching rainfall, thus allowing sewers to be pumped before the storm. This will permit sewers to store contaminated stormwater, the dirtiest water being sent to the treatment plant. Further long range plans are being made to meet future demands of the region.
W71-06359

STEEL PIPE SELECTED FOR STORM SEW SYSTEM.
For primary bibliographic entry see Field 08G.
W71-06360

UNDERWATER SEWAGE STORAGE AN TO POLLUTION ABATEMENT.

Am City, Vol 84, No 9, p 30 and 34, Sep 1969.

Descriptors: *Construction materials, Storm noff, Pollution abatement, Waste storage, O flow.
Identifiers: *Rubber storage containers, St tank, Anacostia River.

Goodyear Tire and Rubber Co. and Underwa Storage, Inc. of Washington D.C. have announ a joint project to attack water pollution by coll ing wastes in huge, collapsible, underwater, r berized tanks. Two prototype systems are be tested in the Anacostia River in Washington; on trap stormwater overflow, and the other nea marina to collect wastes from boats. These stor tanks could resolve a variety of problems such threats of river fires caused by accidentally-ignit oily wastes, and pollution from stormwater wh was previously eliminated only through co sewer reconstruction.
W71-06361

UNDERWATER LINE SPANS 32 FE BETWEEN SUPPORTS.
For primary bibliographic entry see Field 08F.
W71-06362

SYMPOSIUM ON STORM SEWAGE OVE FLOWS.

Inst Civil Engrs (London), 1967. 160 p.

Descriptors: Hydraulics, Statistics, Overflow.
Identifiers: Sewer separation, Storm sewage.

The twelve papers presented consist of experim tal studies, which provide technical data on fl conditions, performance of sewerage systems a design factors for various situations. Particular tention is paid to behavior of mixed flows and both vertical and horizontal separation methods.
W71-06363

STORM WATER RETARDING BASINS SOL URBAN DRAINAGE PROBLEMS,
A. P. Aitken.

Descriptors: *Watersheds (Basin), Drain systems, Design, Hydraulics, Hydrologic aspects.
Identifiers: *Australia, Stormwater Basins.

Urban flooding problems solved by Melbourne a the Metropolitan Board of Works are discuss Hydrologic and hydraulic problems posed in des of retarding basins are explained. 16 stormwater r tarding basins varying in capacity from 13 to 23 acre feet were constructed to reduce peak fl downstream of basin by temporarily storing porti of inflow from upstream catchment. Land acqu tion, design considerations, and cost of basins mentioned.
W71-06364

FREQUENCY OF STORM-SEWAGE OVE FLOWS. THE FREQUENCY OF STOR SEWAGE OVERFLOWS IN COMBIN SEWERAGE SYSTEMS IN CONNECTI WITH STORAGE AND PUMP CAPACITY, CO CLUSIONS FROM THE RAINFALL DATA THE KNMI FOR 1926-1962,
W. O. J. Bottger, and A. G. v.d. Herik.
Water (WTRHA7), Vol 50, p 154-161, 1966.

Descriptors: *Overflow, Data collections, Frequ cy analysis, Precipitation (Atmospheric).
Identifiers: *Storm sewage, *Netherlands.

abulated and graphical data on the number of perations of storm-sewage overflows and the mounts of overflow at De Bilt, Netherlands, in the eriod 1926-1962 are presented. These data were ompiled by a computer using the Ribbius-Kragt-Kuipers method (in which it is assumed that no verflow will occur until the sewers are filled to the rest of the lowest weir). The average overflow requency, calculated monthly, reached a maximum in August and a minimum in March. Results or individual years and individual months were uite variable, and no useful relations could be ound between the annual precipitation, the umber of operations of the overflows, and the mounts of overflow.
W71-06365

TORM OVERFLOWS AND STORM SEWAGE,
ohn T. Calvert.
urveyor, Vol 85, p 22, Apr 1970.

Descriptors: *Sewage disposal, *Design standards, Design criteria, *Separation techniques.
Identifiers: *Storm overflows, *Storm sewage, Great Britain.

Conclusions of the Final Report of the Technical Committee on Storm Overflows and the Disposal of Storm Sewage are summarized. The Ministry of Housing and Local Government accepted the report's recommendations regarding the general design and setting of storm overflows, and they are considering recommendations for further research and investigation. The major outcome of the report proposes a formula for the setting of storm overflows which replaces the former method of fixing the setting at 6 d.w.f. Features and advantages of the formula are given. Sewer separation was considered but eventually rejected by the committee because of the huge cost involved and the inevitable pollution from surface water drains of separate sewers. Other areas studies were the effects of storm sewage on rivers and the composition and strength of storm sewage.
W71-06367

MORE THAN JUST A BUILDING,
For primary bibliographic entry see Field 08A.
W71-06369

WHITHER WATER POLLUTION CONTROL,
C. P. James.
Water Pollution Control, Vol 67, No 5, p 579-583, Sep 1968.

Descriptors: *Sewage disposal, *Water pollution, *Overflow, Flow rates.
Identifiers: *Hydraulic analysis, Storm sewage.

The author comments on sewage disposal, river pollution prevention services, and research in a general manner. He contends that storm overflow problems are more easily solved on large works than on smaller ones. James contests the equivalent of 3xd.w.f. for the sewage rate of flow in dry weather as the standard measurement.
W71-06370

CRITICAL OBSERVATIONS FOR HYDRAULIC MEASUREMENTS OF FIXED STORM-SEWAGE OVERFLOWS,
. Jehne.
Wasserwirtsch-Wassertech (WSWSAO), Vol 17, No 4, p 122-127, Apr 1967.

Descriptors: *Specific capacity, Sewerage.
Identifiers: *Storm overflows, Combined sewers.

n connection with hydraulic measurements for torm sewage overflows, the author discusses the rrors which are caused by using the concept 'dilution'. The specific concentration of one or more ubstances (referred to as the specific load) is ecommended as the criterion for the permissible oad of combined sewerage systems on the receiving water. Equations are developed for calculating the maximal critical values for the specific load and runoff.
W71-06372

OVERFLOW STUDIES AT A SEWER SYSTEM OF A METROPOLITAN CITY,
For primary bibliographic entry see Field 08B.
W71-06373

ALTERNATIVES TO SEPARATION OF COMBINED SEWERS,
For primary bibliographic entry see Field 05D.
W71-06374

METHOD OF AND MEANS FOR DEALING WITH STORM-WATER OVERFLOWS IN SEWERS AND LIKE DRAINAGE SYSTEMS,
For primary bibliographic entry see Field 08B.
W71-06375

STEPS TO SUCCESS IN WATER POLLUTION CONTROL,
Charles V. Gibbs.
Public Works, Vol 101, No 5, p 62-67, May 1970.

Descriptors: *Overflow, *Pollution abatement, *Sludge digestion, Sewage treatment, Separation techniques.
Identifiers: *Interceptor sewer, *Seattle, Combined sewers.

Plans and actions of the Municipality of Metropolitan Seattle (Metro) in regard to combatting the city's water pollution problems are presented. Metro has devised various solutions to underground construction problems with pipelines and pumping stations. Other problems tackled by Metro include the removal of digested sludge from Puget Sound and the elimination of combined sewer overflows. Sewer separation is not presently feasible because of the expense, so the Metro interceptor system is being ordered to run the entire system. In the meantime, money originally reserved for storm water holding tanks is being contributed to the city's proposed sewer separation system. Metro is continuing its innovative engineering programs and is coordinating its activities with community agencies working in the same or related fields.
W71-06379

LETTERS TO THE EDITOR--WATCh OUT FOR CROSS CONNECTIONS,
Gary D. Hutchinson.
Am City, Vol 84, No 1, p 21, Jan 1969.

Descriptors: *Construction equipment.
Identifiers: *Storm sewers.

Additions are made to a previously-published article concerning hazards of well-to-storm-sewer connections. In one southeastern city, these connections were not protected from backflow, thus, the municipal water system was subject to dangerous innundation from storm sewers. City officials corrected the situation by installing above-ground, air-gap separations.
W71-06381

NEW REGULATIONS AND CONSTRUCTIONS OF STORM-SEWAGE OVERFLOWS, FOR THE RELIEF OF RECEIVING WATERS,
For primary bibliographic entry see Field 08B.
W71-06382

A BREAK FROM ACCEPTED PRACTICE . . . BRINGS STORM-WATER CONTROL WITHIN REACH OF OUR BOROUGH'S POCKETBOOK,
L. L. Lowry.
Am City, Vol 83, No 6, p 108-109, Jun 1968.

Descriptors: *Reservoir storage, Storm runoff.
Identifiers: *Stormwater control.

State College, Pa. constructed a reservoir to contain runoff until after a storm instead of installing a more costly water-carrying conduit. An electrically contolled gate closes when rain causes the water level in the reservoir to rise, and it opens when the storm subsides, thus, allowing the rainwater to drain. As a part of State College's sewage project, a new storm trunk line was built contrary to common practice; that is, from the center of the job downstream, to reduce the threat of the pipe coming afloat in the event of a flash flood. This plan was also successful; flood water was forced inside the pipe rather than flowing around the outside and causing flotation. State College also formed a Storm Water Authority to undertake the financing of such storm water control project.
W71-06384

WATER STORAGE METHODS -- FROM CUPPED HANDS TO COMPUTERS,
For primary bibliographic entry see Field 08A.
W71-06385

THE SEWER HAD TO BE CLEANED BEFORE SNOWFALL,
Charles Knecht.
Am City, Vol 84, No 10, p 120 and 123, Oct 1969.

Descriptors: *Maintenance, *Sewers, Hydraulics.
Identifiers: *Sewer cleaning, Sewer hydraulics.

In Houghton, Michigan, a cold-climate town, water pollution and sewage problems are serious due to the sand and grit from street traction abrasives, which enter sewer interceptors during rain and spring thaw conditions. Not only do the interceptors become clogged and sewers inoperable, but public health is threatened by unclean water developing from overflow bypassing treatment. The town hired a company this year to utilize traditional cleaning techniques to unclog the sewer system. The line was only two years old and designed to self-clean, but preventive maintenance programs are necessary for all sewers in cold-climate towns like Houghton.
W71-06396

EXPERIMENTAL ESTIMATION OF DETENTION IN STORM SEWER SYSTEM,
For primary bibliographic entry see Field 08B.
W71-06404

HOW TO THINK ABOUT INSTRUMENTATION AND CONTROL,
Martin L. Roth.
Calif Water Pollution Control Association, Los Angeles, Bulletin, Vol 6, No 2, p 12-18, Oct 1969.

Descriptors: *Sewage treatment, *Instrumentation, *Control structures, *Control systems, *Treatment facilities.

Instrumentation and control are defined and applied to a sewage treatment process. Guidelines for operators are directed toward achieving highest efficiency from plant installations.
W71-06409

STORM OVERFLOWS AND THE DISPOSAL OF STORM SEWAGE.
For primary bibliographic entry see Field 08A.
W71-06417

NOTES ON WATER POLLUTION.
Inst Sewage Purif, J Proc, Part 2, p 199-202, 1966. 1 graph, 3 ref.

Descriptors: *Sewers, Investigations, Sewage, Water pollution, Runoff, Storage tanks.
Identifiers: *Storm sewage, *Combined sewers, *Storm overflows, Great Britain.

Studies were performed in three areas served by combined sewerage systems on the amount, com-

position, and pollution load of stormwater overflows. There was regularity in the volume of storm sewage at the three sites in relation to impermeable area, total rainfall, and dry-weather flow; however, no regularity was detected in composition. Generalizations were made regarding runoff, sewage dilution, single storm discharges, etc., and specifics for each locale were also described. Recommendations were made for the placement of storage tanks alongside of storm overflows and for experimentation in designing different types of overflows in order to reduce pollution load discharges.
W71-06418

MAIN DRAINAGE,
For primary bibliographic entry see Field 08A.
W71-06422

COMPUTERS IN HONG KONG PUBLIC WORKS,
A. T. Armstrong-Wright.
Surveyor, Vol 84, No 4029, p 34-39, Aug 22, 1969. 12 fig.

Descriptors: *Computers, *Computer programs, *Project planning, Highways, Water supply, Expenditures, Sewage disposal, Design, Hydrologic data.

This article describes applications of electronic computers to public works projects in Hong Kong. Their feasibility is obvious due to their speed and accuracy. Applications of computers are discussed for the following areas: project scheduling; highways (road alignment, flyover beam design, pile loading and setting-out road curves and flyovers); water supply (hydrologic data, dam stability analyses, flood balancing reservoirs, yield of water supply schemes, operation of reservoirs, and project appraisal); and expenditure control. In the area of sewage disposal, computers aid in developing suitable designs for multi-port diffusers on ends of submarine outfalls. Computers also process hydrologic data which engineers use in water management and operation of existing facilities. The author concludes that as time progresses, increased use will be made of computers, not only in sophisticated studies but also in day-to-day operations.
W71-06423

PLASTICS IN WATER AND SEWAGE CONTROL,
For primary bibliographic entry see Field 08G.
W71-06424

STRUCTURES PREVENT URBAN SEDIMENT DAMAGE,
For primary bibliographic entry see Field 04D.
W71-06425

INTRODUCTION: ISSUES IN FOOD PRODUCTION AND CLEAN WATER,
Agricultural Research Service, Beltsville, Md. Water Conservation Research Div.
Cecil H. Wadleigh, and Clarence S. Britt.
Agricultural Practices and Water Quality, Iowa State University Press, Ames, Iowa, 1970, Introduction, p xix-xxvii. 1 tab, 3 fig, 4 ref.

Descriptors: *Farm wastes, *Environment, Cattle, Poultry, Hogs, Ammonia, Fertilizers, Nitrogen, Corn, Labor, Nutrients, Potassium, Biochemical oxygen demand, Runoff, Fishkill, Effluent, Pesticides, Coliforms, Nitrates, Eutrophication, Phosphorus, Oxygen, Fish, Conservation, Lagoons, Odor, Sprinkler irrigation, Water quality.
Identifiers: *Waste production, *Feedlots, Mechanization, Chicken litter.

The article introduces the subject matter and content of the book. A look is first taken at the increased consumption of meat in this country. From the total number of animals raised for slaughter, an idea is given of the amount and scope of the animal waste disposal problem. To raise this large number of animals the agricultural industry has relied on a variety of chemical fertilizers and pesticides to increase yields. Runoff from feedlots and agricultural lands has caused eutrophication and associated fish kills. However these are not the only nutrient sources. Conservation practices are needed to prevent water flowing through feedlots to run directly into a water course. As such secondary or even tertiary lagoons may be required. Recycling of wastes should be the optimum means of disposal. Sound conservation farming is needed to assure beneficial use of agricultural wastes and to effectively protect the quality of water in our streams and reservoirs. (See also W71-05437) (White-Iowa State)
W71-06429

LAND AND WATER MANAGEMENT FOR MINIMIZING SEDIMENT,
Iowa State Univ. Ames. Dept. of Agronomy.
Minoru Amemiya.
Agricultural Practices and Water Quality, Iowa State University Press, Ames, Iowa, 1970, Chapter 3, p 35-45. 5 tab, 28 ref.

Descriptors: *Land management, *Water management, *Sediments, *Soil erosion, Sediment yield, Soil stabilization, Sediment transport, Energy dissipation, Soil properties, Slopes, Farm management, Infiltration, Storage capacity, Vegetation, Velocity, Flow, Mulching, Erosion control, Cultivation, Runoff, Strip cropping, Terracing, Contour farming.
Identifiers: Detachment, Universal Soil Loss Equation.

The most logical and direct approach to solving our agriculturally related sediment problem is the stabilization of the sediment source by controlling soil erosion through the use of proper land and water management practices. An understanding of the factors affecting soil erosion by water is required in order to effectively protect the soil. The Universal Soil Loss Equation provides a framework for discussing erosion control measures. A vegetative cover or surface mulch is one of the most effective means of controlling runoff and erosion, and is discussed in some detail. A natural result of this fact is the creation of tillage methods which leave a mulch or crop residue on the surface. Examples of their effectiveness in controlling soil erosion are given. Contour farming, strip-cropping and terracing are slope modification methods for erosion control. Slope modification measures combined with soil conserving tillage practices can be effective in reducing soil erosion from cropped land. However, to become widely accepted, such practices must fit efficient farming operations and must be economically feasible. (See also W71-05437) (White-Iowa State)
W71-06432

FERTILIZER MANAGEMENT FOR POLLUTION CONTROL,
Minnesota Univ., St. Paul. Dept. of Soil Science.
W. P. Martin, W. E. Fenster, and L. D. Hanson.
Miscellaneous Publication Paper No 1360 of the University of Minnesota Agricultural Experiment Station, St. Paul. Agricultural Practices and Water Quality, Iowa State University Press, Ames, Iowa, 1970, Chapter 9, p 142-158. 68 ref.

Descriptors: *Fertilizers, *Nitrogen, *Phosphorus, Nutrients, Phosphates, Soil erosion, Sedimentation, Sediments, Soils, Water supply, Eutrophication, Cultivation, Nitrates, Farm wastes, Wells, Water pollution, Nitrification, Irrigation, Denitrification.
Identifiers: *Pollution control, *Fertilizer use, Nutrient removal, Feedlots.

Nitrogen and phosphorus, as nutrient elements, are important to both land and aquatic plants, and normally reach water supplies via land runoff in the erosion debris. Fertilizer usages in the midcontinent area are rapidly increasing to maxim production and increase efficiency, and further creases are expected. Fertilizer phosphorus quic converts to unavailable forms in mineral soils the evidence indicates that one of the ways reducing the level of soluble phosphorus in wa would be to effect soil contact such as by filtrat through the soil medium. Nitrogen fertilizer ap cation rates should approximate crop needs, wh for a given soil type and climatic zone are based production potential estimates for the crops to grown. Management recommendations refi through the years for maximizing production not incompatible with the objective of reduc nutrient contamination of natural waters. Furt research is needed on nutrient balances and re tions in soils to maintain supplies at levels nee for crop production. Water quality standards established by the federal and state water pollut control groups should be compatible with the ne for maintaining adequate nutrients for effici crop production consistent with management p grams designed to minimize losses to adjac water supplies. (See also W71-05437) (White-Io State)
W71-06437

PESTICIDES AND PEST MANAGEMENT F MAXIMUM PRODUCTION AND MINIMU POLLUTION,
Iowa State Univ., Ames. Dept. of Zoology and E tomology.
Don C. Peters.
Agricultural Practices and Water Quality, Io State University Press, Ames, Iowa, 1970, Chap 14, p 209-223. 2 fig, 1 tab, 45 ref.

Descriptors: *Pesticides, *Pest control, Productiv ty, Water pollution, Climates, Insects, Contr Biocontrol, Cultural control, Chemcontr Mechanical control, Insecticides, Cotton, Timb management, Corn, Soybeans, Tobac Chlorinated hydrocarbon pesticides, 2-4-D, DDT
Identifiers: *Pest management, Natural contr Applied controls.

The author first discusses natural and applied co trols which man utilizes in an effort to reduce los caused by pests. Natural control can be subdivid into climatic, edaphic, and biotic aspects. Appli controls are biological, cultural, legal, or chemi practices. Examples of pest management in seve areas of production are given. The role of agric tural pesticide use and clean water is pointed o Suggestions are given, both legislative and prac cal, which can be used to reduce pesticide pollut of water. If the public demand for sophistication pest control is to be achieved, more imaginati research support will have to be found. (See al W71-05437) (White-Iowa State)
W71-06441

LEGAL ASPECTS,
Iowa Univ., Iowa City. Coll. of Law.
N. William Hines.
Agricultural Practices and Water Quality, Io State University Press, Ames, Iowa, 1970, Chapt 26, p 365-376. 26 ref.

Descriptors: *Legal aspects, *Water pollutio Farm wastes, Pesticides, Sediments, Fertilize Riparian rights, DDT, Water quality, Regulatio Water Quality Act, Standards, Administrati agencies, Pesticide residues, Soil erosion, Silting.
Identifiers: *Point sources, Common la Nuisance, Feedlots, Registration.

The forec of the law has not been brought to be on agriculture as it has on other major sources water pollution. Agricultural pollution has thus been ignored because it is less visible and more d ficult to correct than are wastes from municipaliti and industry. Currently only those types of agricu tural pollution that are obvious and subject direct control receive legal attention. As poi sources are brought under control, agriculture more subtle contributions to water pollution will

tract regulatory concern. Public regulation of agricultural pollution will take two primary forms: (1) direct restrictions on the use of chemical inputs to agricultural production, and (2) regulation of land use patterns and practices. Examples of the first type of regulation are prohibitions or limitations on the use of certain chemical biocides, fertilizers, and other additives. Land use regulations seem very likely to be necessary to effect a meaningful reduction in soil erosion. The ideal construct might involve the employment of land-use controls by a comprehensive watershed management authority. If this does not come to pass, exercise of such powers by other local districts such as soil conservation districts, conservancy districts, or drainage districts would be feasible, as would granting similar powers to the local pollution control agency. (See also W71-05437) (White-Iowa State)
W71-06446

ECONOMIC ASPECTS,
Iowa State Univ., Ames. Dept. of Economics.
John F. Timmons.
Journal Paper No J-6469 of the Iowa Agricultural and Home Economics Experiment Station, Iowa State University, Ames, Iowa. Agricultural Practices and Water Quality, Iowa State University Press, Ames, Iowa, 1970, Chapter 27, p 377-389. 9 ref.

Descriptors: *Water quality, *Economics, Management, Water quality control, Water resources, Costs, Benefits, Standards, Measurement, Water Quality Act.
Identifiers: *Quality levels, *Water supplies quality, *Water demand quality, Least cost method, Externalities, Public intervention, Water quality management, Quality use.

The first step toward meeting water quality management relating to water use within agriculture is being taken through becoming aware of the importance of water quality problems. The need to recognize the quality heterogeneities of water from demand and supply orientations is evident. The importance of demand orientations and requirements is paramount in specifying quality standards which vary among uses, spatially and temporally. Supply qualities must be geared to qualities demanded by uses. Least-cost methods are necessary in meeting demand qualities. In assigning benefits and costs to water uses, the problems of externalities, measurement, and intervention are crucial. Economics with its legacy of methods, theory, and its corps of resource economists is a necessary part of the multidisciplinary approach in planning and in carrying out relevant research necessary for education, legislation, and administration of water quality management. (See also W71-05437) (White-Iowa State)
W71-06447

ALLIANCE FOR ACTION,
Federal Water Pollution Control Administration, Kansas City, Mo. Missouri Basin Region.
John M. Rademacher.
Agricultural Practices and Water Quality, Iowa State University Press, Ames, Iowa, 1970, Chapter 28, p 390-396. 10 ref.

Descriptors: *Farm wastes, *Water pollution, Agriculture, Fishkills, Pesticides, Sediments, Runoff, Regulation, Zoning, Management, Waste treatment, Dissolved oxygen.
Identifiers: *Feedlots, *Technical base, *Inventory, Registration, Feedlot runoff, Animal waste management, Quantities, Runoff strength, Population equivalent.

The author chooses to look at animal wastes since this pollutant lends itself to more classical solutions than do other agricultural pollutants. He then pieces together the various interests involved with the animal waste problem. A technical base of information is required to establish effective controls. The development of an inventory noting animal production, concentration and location is an essential element of the technical base for the animal waste problem. Specific research and development needs must be delineated in accordance with the expected trends of the feedlot industry. Regulations are needed to ensure feedlot operators that measures they employ will guarantee a reasonable tenure of operation. Zoning regulations may be necessary and desirable. Mandatory registration should be an integral part of feedlot regulations. A sound animal waste management program encompasses prevention, reduction, treatment, and disposal of animal wastes. No one treatment process or system will be the solution for all animal production units. A variety of management and treatment systems will have to be developed. If it is the public who must bear the cost, then agriculture must have the courage to include waste treatment as a part of its production costs. (See also W71-05437) (White-Iowa State)
W71-06448

ACCOMPLISHMENTS AND GOALS,
Federal Water Pollution Control Administration, Washington, D.C. Agricultural and Marine Pollution Control.
Harold Bernard.
Agricultural Practices and Water Quality, Iowa State University Press, Ames, Iowa, 1970. Chapter 29, p 397-407. 2 fig, 1 tab, 2 ref.

Descriptors: *Water pollution, *Water quality, *Standards, Environment, Research and development, Management, Water Quality Act, Nebraska, Water supply, Water utilization, Water sports, Pollution abatement, Biochemical oxygen demand, Sewage treatment, Farm wastes, Nutrients, Return flow, Expenditures.
Identifiers: *Federal Water Pollution Control Administration, Agricultural pollution.

The article gives information as to the scope and extent of FWPCA activities relating to the control of agricultural pollution. Over $4 million has been expended in 1969 and 1970 on research and demonstrations involving pollution abatement from pesticides, nutrient runoff, irrigation return flows and feedlot operations. An example of criteria for water quality standards is given. Recommendations from a recent task force of seven cognizant Federal agencies studying the agricultural pollution problem are given. Data is presented indicating the need for municipal, industrial and agricultural pollution control. New techniques and systems must be developed to increase the quantity of pollutants removed from these sources before it reaches our streams. (See also W71-05437) (White-Iowa State)
W71-06449

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

UNDERSTANDING SYSTEMS ENGINEERING,
Lockheed-California Co., Burbank.
E. J. Kovalcik.
J Syst Manage, Vol 21, No 9, p 15-21, Sept 1970. 7 p, 3 fig, 8 ref.

Descriptors: *Systems engineering, *Methodology, *Objectives, Ideas, Management, Requirements, Analytical techniques, Optimization, Models, Benefit-cost analysis, Systems analysis, Project planning, Scheduling, Feedback, Procedures, Performance, Decision making.

The Systems Engineering (SE) method recognizes that each system is an integrated whole even though composed of diverse, specialized structures and subfunctions. The method also recognizes that any system has several objectives and that the balance between them may differ widely from system to system. The SE methods seek to optimize the overall system functions according to the weighted objectives and to achieve maximum compatibility of its parts. The major steps in SE that can be helpful in setting up a conceptual definition for management are: (1) definition of the operational requirement, (2) development and evaluation of new concepts and techniques, (3) study of tradeoffs, (4) definition of performance goals and interfaces, and (5) systems management--the art of tying the whole thing together. The article contains a general discussion about: systems and subsystems, basic concepts and ideas of SE, terms common to SE, objectives for SE, and SE implementation and management. SE, properly applied and implemented, will give management the best opportunity to manage technical programs with maximum visibility, and when coupled with schedules, cost, and risk inputs, can become as close as possible to optimum management. (USBR)
W71-05918

WATER RESOURCES SYSTEMS ANALYSIS OF DISCRETE DIFFERENTIAL DYNAMIC PROGRAMMING,
Illinois Univ., Urbana. Dept. of Civil Engineering.
M. Heidari, V. T. Chow, and D. D. Meredith.
Civil Engineering Studies, Hydraulic Engineering Series, No 24, (UILU-ENG-71-2008), January 1971. 118 p, 15 tab, 21 fig, 30 ref, 2 append. OWRR Report B-030-ILL (4).

Descriptors: *Systems analysis, *Optimization, *Dynamic programming, *Planning, Reservoirs, Irrigation, Hydroelectric power, Invertible systems.

The optimization of operating policies of multiple-unit and multiple-purpose water resources systems by traditional dynamic programming with the use of high-speed digital computers encounters two major difficulties: excessive memory requirements, and tremendous amounts of computer time requirements. This report describes an iterative method named discrete differential dynamic programming (DDDP) which can ease the above difficulties considerably. The method starts with a trial trajectory satisfying a specific set of initial and final conditions and applies Bellman's recursive equation in the neighborhood of this trajectory. At the end of each iteration step a locally improved trajectory is obtained and used as the trial trajectory in the next step. It is shown that the method is particularly effective in the case of so called 'invertible' systems. The merits of the proposed approach are demonstrated through its application to two four-unit, two-purpose water resources systems. To save computer time the examples are restricted to deterministic hydrologic inputs.
W71-05922

A PROGRAMMING MODEL FOR FARM IRRIGATION SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 03F.
W71-05923

A MODEL OF PUBLIC DECISIONS ILLUSTRATED BY A WATER POLLUTION POLICY PROBLEM,
Resources for the Future Inc., Washington, D.C.
Robert Dorfman, and Henry P. Jacoby.
In: Public Expenditures and Policy Analysis, Chicago, Markham Publishing Company, p 173-231, 1970.

Descriptors: *Decisionmaking, *Water pollution, *Mathematical studies, *Water quality, *Cost benefit analysis, Optimization, Data, Management, Government, Rivers, Sewage, Costs, Technology, Taxes.
Identifiers: *Pareto optimality, *Political decision process, Linear programming, Canneries.

This article attempts to present a complicated problem of government decision-making in terms of a formal model. The hypothetical case devised for this purpose incorporated many of the salient features of real water pollution control problems

including a wide variety of hydrologic, technical, social, political and economic issues. Deep seated conflicts of interests among the participants was also incorporated. The model was implemented and provided intelligible results. The model utilized such data as became available and then provided a method of analyzing the way different assumptions would affect various plans likely to be adopted by the decision-making commission. It incorporated information about the commission and also provided a framework for predicting political judgments about the various possible decisions. The model is readily applicable to the circumstances of the assumption which it was based, namely that a water pollution control commission is responsive to the wishes of its constituency. The mathematical analysis presented in this article is designed to be of assistance in understanding and facilitating the lengthier and more cumbersome decision-making processes in current use. (Murphy-Rutgers)
W71-05939

STREAMFLOW SYNTHESIS,
Harvard Univ., Cambridge, Mass.
For primary bibliographic entry see Field 04A.
W71-05946

QUANTITATIVE ANALYSIS IN PUBLIC FINANCE,
York Univ. (England).
Alan T. Peacock.
New York, Praeger Publishers, 266 p, 1969.

Descriptors: *Economic efficiency, *Cost-benefit analysis, *Mathematical studies, Decisionmaking, Taxes, Statistics, Budgets, Forecasting, Fishing, Income, Time, Social aspects, Surveys.
Identifiers: *Quantitative analysis, *Public finance, *Quality problems, *Econometric analysis.

This book consists of a series of studies of the various aspects of quantitative analysis. The studies presented offer a useful concept of the whole area of quantitative analysis to economists generally, and especially to researchers in the field of public water resources. Areas treated in the book are survey research, statistical measures, cost-benefit analysis, measuring efficiency, econometrics of taxation, budget effects and fiscal performance in developing countries. Each topic is presented and then analyzed for both strengths and weaknesses. Practical suggestions are offered for the successful use of quantitative analysis in intelligent policy-making. Four areas requiring improvement are cited; namely, the theory of incidence and application of cost-benefit studies, the development of data on measures linking policy to endogenous economic response, experimental design, and linkages between model-building and policy-making. (See also W71-05948) (Murphy-Rutgers)
W71-05947

OPTIMIZATION TECHNIQUES FOR WATER RESOURCE SYSTEMS,
Washington State Water Research Center, Pullman.
David L. Schreiber.
Washington State University, State of Washington Water Research Center, Open-File Report No 6, November 15, 1968. 48 p, 4 fig, 21 ref.

Descriptors: *Engineering education, *Water management (Applied), *Model studies, *Computer models, Computer programs, Economics, Washington, California, Sampling, Data processing, Reservoirs, Water quality control, Simulation analysis, Hydrologic aspects.
Identifiers: *Water resources systems engineering, University of California at Los Angeles, Program of study, Water systems, Washington State University.

The author attended a short course entitled Optimization Techniques in Planning, Design, and Operation of Water Resource Systems at the University of California at Los Angeles in 1968, and summarizes the topics covered in the course. Linear programming, dynamic programming, and non-linear programming for water resource systems are outlined, along with advantages and disadvantages, hydrologic system models, methods of simulation, and water quality control programs. Multi-purpose water systems, supply and demand, and cost factors are summarized. On the basis of his other water resources background and what he learned in this course, the author outlines the current program of study available to a Water System Engineering major presently at UCLA; and after listing the related courses currently offered at Washington State University, suggests inclusion there of a graduate-level course entitled Water Resources Systems Engineering. (Yensen - Arizona)
W71-06062

WATER QUALITY MODELING AND PREDICTION,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 05G.
W71-06186

GRANTS FOR PREPARATION OF COMPREHENSIVE AREA PLANS FOR WATER AND SEWER SYSTEMS.
Department of Agriculture, Washington, D.C.

Code of Federal Regulations, Title 7, Chap XVIII, secs 1823.61 thru 1823.70 (1970). 4 p.

Descriptors: *Rural areas, *Grants, *Sewerage, *Water supply, Government finances, Economics, Financing, Financial analysis, Governments, Federal government, Government supports, Allotments, Capital, Capital supply, Credit, Water resources development, Water policy, Sewage treatment, Sewage disposal, Waste disposal, Wastes Waste treatment, Water management (Applied), Planning.

The Secretary of Agriculture promulgates herein rules governing issuance of grants for preparation of comprehensive area plans dealing with water and sewer systems in rural areas. These regulations explain the following: (1) objectives of grants, (2) eligibility for grants, (3) expected content and purposes of grants, (4) technical and professional assistance for planning, and (5) procedures for processing applications for grants. State directors are authorized to approve comprehensive water and sewer planning grants when the amount of the grant does not exceed $5,000. County supervisors will supervise and service each grant to insure that the conditions of the grant are being fulfilled. (Robinson-Florida)
W71-06284

SIMULATION OF RUNOFF FROM URBAN WATERSHEDS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 04C.
W71-06306

OPERATIONS RESEARCH STUDY OF WATER RESOURCES - PART II,
Arizona Univ., Tuscon. Dept. of Hydrology and Water Resources.
Chester C. Kisiel, and Lucien Duckstein.
Water Resources Bulletin, Vol 6, No 6, p 857-867, December 1970. 4 fig, 2 tab, 11 ref.

Descriptors: *Water resources, *Water resources development, *Methodology, *Planning, *Operations research, *Mathematical models, Systems analysis, Model studies, Data processing, Pricing.
Identifiers: *Tuscon basin, *Arizona, Pricing policies, Management models, Multiple linear regression, Discrete convolution relation.

Applications of systems methodology to water problems of the Tuscon basin are summarized. Natural recharge is estimated by means of a discrete convolution relation in which the unit impulse response of an aquifer is derived from basic hydro-dynamic laws. A temporal model of sequences of wet and dry periods during the summer thunderstorm season is based on a multiple linear regression equation that relates total rainfall amount during the wet period to the duration of the wet period and volume of peak rainfall. A spatial model predicts point rainfall frequency of maximal and minimal amounts of thunderstorm rainfall. A static management model allocates Tuscon ground-water, Avra Valley water, Colorado River water, and reclaimed waste water to municipal, industrial, and agricultural users within a pricing framework. For a range of pricing policies the model clearly demonstrates the opportunity costs to the community by use of higher-priced water supplies such as Colorado River water in lieu of Tuscon ground-water. The role of worth of data studies in relation to data analysis, model building and management studies is also introduced. (Davis-Chicago)
W71-06307

MODELING AND CONTROL OF THE POLLUTION OF WATER RESOURCES SYSTEMS VIA A MULTILEVEL APPROACH,
Case Western Reserve Univ., Cleveland, Ohio.
Dept. of Systems Engineering.
Yacov Y. Haimes.
Water Resources Bulletin, Vol 7, No 1, p 93-101, February 1971. 2 fig, 16 ref.

Descriptors: *Model studies, *Water pollution, *Water pollution control, Optimization, Mathematical models, Water resources.
Identifiers: *Water resource systems, *Multilevels optimization, Lagrange multipliers.

The problem of modeling and control of water pollution is considered. A general mathematical model, where the pollution effluent is discharged directly into the lake, or into a bypass pipe leading to an advanced Waste Water Treatment (AWT) plant, is developed. The Water resource System (WRS) under consideration is decomposed into N subsystems. The pollution effluent imput vector to each subsystem includes the water quantity and different water characteristics such as BOD, DO, pH, conductivity, temperature, algae, phosphates, nitrates, etc. Treatment cost functions and quality transition functions as well as system model constraints are introduced, where all functions can be nonlinear. A system Lagrangian is formed to incorporate the system constraints and coupling. The Lagrangian is decomposed into N independent subsystems, and a two level optimization methodology is introduced. Each subsystem is independently and separately minimized at the first level assuming known Lagrange multipliers using optimal values for effluent inputs from all subsystems obtained from the first level. Economics interpretation on the Lagrange multipliers reveals that they are merely prices imposed by the central authority (second level) for the pollution caused by the subsystems. Advantages of the multilevel approach are discussed. (Davis-Chicago)
W71-06311

6B. Evaluation Process

DEVELOPMENT OF WATER RESOURCES IN ASIA AND THE FAR EAST-REPORT OF THE NINTH SESSION OF THE BIENNIAL REGIONAL CONFERENCE ON WATER RESOURCES DEVELOPMENT.
Economic Commission for Asia and the Far East (UN), New York.

Water Resources Journal, Economic Commission for Asia and the Far East (ST/ECAFE/SER.C/86), p 45-76, September 1970. 32 p, 49 ref.

Descriptors: *Conferences, *Water resources development, *Foreign countries, *Reviews, Irrigation, Flood control, Soil conservation, Reclama-

tion, Drainage, Surface waters, Agriculture, Projects, Planning, Costs, Evaluation, United Nations, Watershed management.
Identifiers: *Bangkok (Thailand).

The conference proceedings of the Water Resources Development of the secretariat of the United Nations Economic Commission for Asia and the Far East (ECAFE) held at Bangkok, Thailand, September 28 to October 5, 1970 are summarized under the following main agenda items: Biennial review of water resources development in the countries of the ECAFE region in relation to irrigation, reclamation and drainage, flood control and soil conservation costs, 1969-1970; Scope of water resources development to meet the food requirements of the ECAFE region during the next two decades; Achievement of goals subsequent to project construction: Efficiency in water resources project management and water use; and long-term requirements in water resources development in relation to the world-wide strategy of the second United Nations Development Decade. (Woodard-USGS)
W71-05864

WATER RESOURCES DEVELOPMENT IN LAOS.
Economic Commission for Asia and the Far East (UN), New York.

Water Resources Journal, United Nations Economic Commission for Asia and the Far East (ST/ECAFE/SER.C/86), p 1-44, September 1970. 44 p, 19 fig, 11 tab.

Descriptors: *Water resources development, *Surface waters, *Hydrologic data, Water supply, Water utilization, Projects, Powerplants, Irrigation, Navigation, Flood control, Costs, Foreign countries, Evaluation, United Nations.
Identifiers: *Laos.

Water resources projects in Laos concerning surface water supply, dams, reservoirs, powerplants, irrigation, navigation, flood control, and costs are discussed and hydrologic data tabulated. The Mekong river is one of the great rivers of the world. At the China-Laos-Burma border tripoint, the Mekong leaves China, and flows for 205 km between Burma and Laos, forming their border. Having entered its lower basin, the river begins its eastward swing. From this point to the Mekong-Nam Ou confluence close to the town of Luang Prabang, the river cuts obliquely across the major geological structures with the main tributaries and drainage area located in Laos on the left bank, looking downstream. From the Mekong-Nam Ou confluence, the river makes another abrupt change of course. It turns southward for 250 km through a complex geological zone of igneous and sedimentary rocks. The climate of Laos is marked by two distinct seasons, the wet season lasting from May to October, and the dry season extending from November to April. The average rainfall for the year lies in the 1,300 to 2,300 mm range depending on location. The average annual temperature ranges between 18.5 degrees and 32 degrees C according to latitude and elevation. (Woodard-USGS)
W71-05865

SOCIO-CULTURAL IMPACTS OF WATER RESOURCE DEVELOPMENT IN THE SANTIAM RIVER BASIN,
Oregon State Univ., Corvallis. Water Resources Research Inst.
Thomas C. Hogg, and Courtland L. Smith.
Available from NTIS as PB-198 044, $3.00 in paper copy, $0.95 in microfiche. Oregn Water Resources Research Institute Report WRRI-5, October 1970. 133 p, 9 tab, 10 fig, 65 ref. OWRR Project B-011-ORE (1).

Descriptors: Water resource development, Dams, *Social aspects, Technology, *Planning, Reservoirs, Data collection, Recreation, Population, Income, Benefits, Environment, *Psychological aspects, *Attitudes, Oregon, *Sound impact.
Identifiers: *Socio-cultural system, Social accounting, Economic development, *Santiam River Basin.

The effects of two dams on the behavioral and attitudinal patterns of Santiam residents are studied. The development of the dams from preconstruction through construction to postconstruction provided the background for the environmental and technical changes being studied. Data on these changes in relation to the local socio-cultural system were gathered both by standard research methods and special anthropological techniques. The degree of acceptance of the water system to innovation and change was found to be related to the position of the observer in the socio-cultural system and the relation of larger similar systems. Lack of articulation and planning between various elements of the larger socio-cultural system restricts full development of benefits. Full benefits in the total water resource development process were found to be dependent on seeking consumer values and actions as inputs in the process, thus calling for the added dimension of social accounting in all phases of water. (Murphy-Rutgers)
W71-05921

STRATEGIES FOR ENVIRONMENTAL MANAGEMENT,
Resources for the Future, Inc., Washington, D.C.
Allen V. Kneese.
Public Policy, Vol XIX, No 1, p 37-52, Winter 1971.

Descriptors: *Water pollution control, Resource allocation, Economic efficiency, Waste treatment, Water quality.
Identifiers: *Environmental management, Externality, Recycling, Subsidy, Effluent charge, Social cost, Regional management.

This article suggests that present environmental pollution problems are primarily the result of failures in the system of economic incentives. The example of residuals from production and consumption of resources is given to stress the need for an efficient approach to the management of congestion. The present federal subsidy-enforcement strategy toward water pollution control is criticized as ineffective and an alternative approach is outlined. This approach has two elements: the waste discharger must bear the costs of damage of his waste disposal activities through effluent charges; pollution problems should be handled through water quality management on a regional basis. The author suggests the effluent charge be on a national basis with regional agencies able to exceed the minimum, if necessary. It is hoped that federal leadership in the implementation of this proposal will lead to effective and efficient water quality management. (Siegenthaler-Rutgers)
W71-05935

WATER POLLUTION CONTROL, RIVER BASIN AUTHORITIES AND ECONOMIC INCENTIVES: SOME CURRENT POLICY ISSUES,
Bowdoin Coll., Brunswick, Maine; and Wisconsin Univ., Madison.
A. Myrick Freeman, and Robert H. Haveman.
Public Policy, Vol XIX, No 1, p 53-74, Winter 1971.

Descriptors: *Water pollution control, *Water quality, River basin commission, Resource allocation, Decision-making, Marginal cost, Economic evaluation, Municipal waste.
Identifiers: *Effluent charge, User charge, Subsidy.

This article examines policy alternatives to the current enforcement-subsidy approach to the improvement of water quality. These proposals emphasize comprehensive river basin planning and water quality management and stress economic incentives, prices and charges, as a means of reducing the output of industrial and municipal wastes. These proposals are used to illustrate the scope of the river basin authority, its powers and functions, the effects of Federal cost-sharing and the river basin authority as a political institution. The author then presents his own proposal for the reform of Federal policy through the establishment of a single experimental water basin authority based on the consolidations of existing agencies responsible for air, land, and water quality in a particular region. This authority would minimize reliance on legal enforcement and stress the use of economic incentives such as user and effluent charges. This approach would yield information on the effectiveness of the regional approach to environmental management and the ability of economic incentives to reduce waste generation at relatively low cost. (Siegenthaler-Rutgers)
W71-05937

OPTIMUM INVESTMENT IN WATER POLLUTION CONTROL,
Federal Water Pollution Control Administration, Arlington, Va.
Edwin L. Johnson.
In: Evaluation Processes in Water Resources Planning, Urbana, Illinois, American Water Resources Association, p 41-57, July 1970.

Descriptors: *Water pollution control, Optimization, Budget constraint, Cost-benefit analysis, Economic efficiency, Secondary treatment, Water quality, Systems analysis.
Identifiers: *Suboptimization, Objective function, Cost effectiveness.

This paper considers the operationalization of optimum investment in water pollution control. Current attempts at optimization result in suboptimization of costs because interrelations among air, water, and solid wastes are not treated. Investment is optimized subject to the secondary treatment and anti-degradation restrictions set by water quality standards. Within the context of water quality standards, the objective function tends to be characterized by constrained cost effectiveness. Recent research has questioned the basis upon which water quality plans are prepared and hence disturbed the predicted relation between pollution abatement and environmental quality. Inadequate implementation by institutions of plans for water pollution control is another obstruction to optimum investment. The author concludes that the major research areas for optimization are economic evaluation, reform of political and governmental institutions, development of means of measuring social preference and then introducing these into the systems analysis part of investment optimization. (Siegenthaler-Rutgers)
W71-05938

ECONOMIC ANALYSIS IN NATURAL RESOURCE PROGRAMS,
George Washington Univ., Washington, D.C.
Jack L. Knetsch.
In: Public Expenditures and Policy Analysis, Chicago, Markham Publishing Company, p 562-579, 1970.

Descriptors: *Economic analysis, *Natural resources, *Government, *Water resource development, *Cost benefit analysis, Flood control, Navigation, Irrigation, Budgets, Water supply, Pollution, Planning, Economic efficiency.
Identifiers: *Public expenditures, Resource allocation, Market incentives.

This article surveys several points pertinent to efforts to improve public expenditure decisions in natural resource programs, especially as related to relevant information and decision tools. Specific topics treated include the changing concerns of natural resource programs, and a sketch of how analytical guides for public expenditures resemble the market allocation of resources. Market incentives may be used increasingly to set priorities in public provision of resource services. The weakness of demand information is cited, along with the consequent effects on rationalizing expenditure

decisions. Finally, an outline is presented of some problems caused by the increasingly important values associated with natural resources largely beyond present quantification methods. A warning is given about the various viewpoints of the results of natural resource programs and an assessment of their efforts. The success of explicit cost-benefit analysis in the past in such areas as water development expenditures is acknowledged, along with the need for the extension of such methods in present applications and the need for greater flows of information to achieve desired investment and allocation guides in this (and others) natural resource areas. (Murphy-Rutgers)
W71-05940

ENVIRONMENTAL QUALITY MANAGEMENT,
Resources for the Future, Inc., Washington, D.C.
Blair T. Bower, and Walter Spoffard.
Natural Resources Journal, Vol 10, No 4, p 655-667, October 1970.

Descriptors: *Technology, *Water pollution, *Air pollution, *Environmental quality, Investment, Water supply, Reservoirs, Water treatment, Water courses, Agriculture, Irrigation, Pesticides, Streamflow, River basins, Effluents, Aeration.
Identifiers: *Material residuals, *Energy residuals, Receptors, Air filters.

This article focuses on those aspects of environmental quality affected by the material and energy residuals generated in man's activities and on those aspects of environmental quality directly affected by production and consumption activities where no residuals are involved. The residuals-environmental quality system is described as a composite of the economic-technologic-ecologic subsystem and the information-response-institution-management subsystem. The elements of the system are tied together by the three flows of material, energy and information. Both the material and energy residuals may be transported through, or deposited in or on, the three environmental media of air, water and land. Water is also discussed in its functions as a storage for residuals and as a receptor for ultimate residual concentrations, along with other elements of the natural environment. The article suggests that environmental quality may be maintained and/or improved through various methods of residuals management. Four measures suggested are the reduction of residuals generation, the modification of residuals after generation, better utilization of the assimilative capacity of the environment, and application of final protective measures. This article is germane to environmental quality management decision-making and particularly as it applies to the water resource area. (Murphy-Rutgers)
W71-05941

URBAN PLANNING ASPECTS OF WATER POLLUTION CONTROL,
Columbia Univ., New York.
Sigurd Grava.
New York, Columbia University Press, 223 p, 1969.

Descriptors: *Water pollution, Watershed management, Waste disposal, Systems analysis, Treatment facilities, Decision making, Cost-benefit analysis, Resource allocation, Simulation.
Identifiers: *Urban planning, Collection network, Recycling.

This book considers the various techniques and methods available in water pollution control and their role in community planning. The sources of pollution, treatment systems along with related financial and administrative considerations are discussed to provide background material in the planning for waste control. The author analyzes water pollution problems within the context of the entire watershed basin and formulates a model relating pollution control and waste management to local economic and ecological considerations. This analysis provides the basis for cost-benefit analysis of a particular watershed. The planning organization for watershed or community pollution control systems requires the formulation of objectives, translation of objectives to guidelines and standards, plan preparation and evaluation along with means of plan execution. The influence of population density and settlement patterns also affect waste management planning for communities. (Siegenthaler-Rutgers)
W71-05944

THE 'PROBLEM SHED' AS A UNIT FOR ENVIRONMENTAL CONTROL,
Resources for the Future, Inc., Washington, D.C.
Allen V. Kneese.
Archives of Environmental Health, Vol 16, No 1, p 124-127, January 1968.

Descriptors: *Water quality, Watershed, Decision-making, Economies of scale, Resource allocation, Economic efficiency, Effluent charge, Systems analysis.
Identifiers: *Problem shed, Externality, Indivisibility, Market failure, Decreasing costs, Environmental control.

This paper considers the role of externalities and indivisibilities in the selection of a problem shed as a unit of environmental planning and control. An example is given of industrial waste discharges that impose external costs on downstream municipal water treatment facilities. Economic efficiency requires that an administrative agency or problem shed be formed to reduce the waste discharge through the imposition of an effluent charge on the waste discharger. The problem shed should be of appropriate size in order to internalize externalities and efficiently manage environmental problems by large scale regional measures. The problem shed is used in research on water quality management but the opposition of local jurisdictions has retarded the implementation of this concept as an administrative agency. (Siegenthaler-Rutgers)
W71-05945

REGIONAL PLANNING,
North Carolina Univ., Chapel Hill.
Maynard Hufschmidt.
New York, Praeger, 1969. 396 p.

Descriptors: *Planning, Cost-benefit analysis, Decision making, Resource allocation, Flood control.
Identifiers: *Regional planning, Objective function, Environmental planning, Economic growth.

This book considers the relationship between regional planning and associated planning fields. The topics considered are regional planning as a field, environmental planning, natural resources planning, planning for community and human resources and planning for economic development. The papers included stress both the theoretical and practical aspects of planning and decision making. The economic context as well as the political institutional context is stressed in plan implementation. The limitations of cost-benefit analysis are noted and the need for broader socioeconomic objectives is mentioned. The discussion of cost benefit analysis and environmental planning make this book relevant to applied water studies. (See also W71-05950) (Siegenthaler-Rutgers)
W71-05949

COMPREHENSIVE ENVIRONMENTAL PLANNING,
Clark Univ., Worcester, Mass.
Robert Kates.
In: Regional Planning, New York, Praeger, p 67-87, 1969.

Descriptors: *Water resource planning, Water pollution, Air pollution, Flood control, Economic value, Economic evaluation, Cost-benefit analysis, Design-criteria.
Identifiers: *Investment decision, Objective function, Matrix.

This essay examines the present scope of environmental planning and identifies some unique aspects of environmental planning within the framework of the investment decision model. The author finds environmental planning similar to water resource planning in the 1930's and to the multipurpose nature of present water resource development. The objectives of individual programs for environmental planning are prevention of sickness, aesthetic stimulation of the senses, and economic value. However, these objectives serve as constraints in an investment decision model. The author also discusses the difficulty of relating the objectives of environmental planning such as economic growth to design criteria and science. The applicability of utility theory, stimulation, and political decision-making is considered for environmental planning. (See also W71-05949) (Siegenthaler-Rutgers)
W71-05950

PESTICIDE RESIDUES AND ENVIRONMENTAL ECONOMICS,
Florida Univ., Gainesville; and Missouri Univ., Columbia.
For primary bibliographic entry see Field 05G.
W71-05951

INFORMATION FOR DECISION MAKING,
Northwestern Univ., Evanston, Ill.
Alfred Rappaport.
Englewood Cliffs, Prentice-Hall, Inc., 447 p, 1970.

Descriptors: *Decision making, Risk, Linear programming, Cost, Regression analysis.
Identifiers: *Capital budgeting, Information technology.

This book contains a series of essays that relate advances in the management sciences and behavioral sciences to the task of effectively designing and using decision-oriented information systems. The role of models in decision-oriented information systems is outlined with problems of implementation and extensions discussed. Methods of dealing with uncertainty of planning and control variables are discussed with several applications given in capital budgeting and linear programming. The impact of information on decisions and performance is considered. The central theme of this book centers on the issues of decision making and accordingly, this is relevant material for water investment studies. (See also W71-05954 and W71-05955) (Siegenthaler-Rutgers)
W71-05953

UNCERTAINTY AND ITS EFFECT ON CAPITAL INVESTMENT ANALYSIS,
Kentucky Univ., Lexington.
Martin B. Solomon.
In: Information for Decision Making, Englewood Cliffs, Prentice-Hall, p 278-283, 1970.

Descriptors: *Project feasibility, Risk, Economic evaluation, Interest rate, Cost, Discount rate.
Identifiers: *Capital budgeting, Sensitivity analysis, Payback period, Present value, Estimation error.

One aspect of capital budgeting is considered, namely, the application of theoretically correct criteria such as present value and discounted rate of return to actual investment decisions. The author contends that these theoretically correct choice criteria have limited practical value when uncertainty is present with respect to cost, revenues and project life. To illustrate this contention, investments with constant annual returns and those with declining annual returns are considered. The results of the sensitivity analysis indicate that relatively small overestimates and underestimates create large errors in the discounted rate of return. For investment decisions characterized by a large amount of uncertainty, the payback criterion can provide results superior to the present value and discounted rate of return methods for project evaluation. This article is relevant to water resources studies concerned with capital budgeting and decision making. (See also W71-05953) (Siegenthaler-Rutgers)

W71-05954

SENSITIVITY ANALYSIS IN DECISION MAKING,
Northwestern Univ., Evanston, Ill.
Alfred Rappaport.
In: Information for Decision Making, Englewood Cliffs, Prentice-Hall, p 174-190, 1970.

Descriptors: *Decision making, Risk, Resource allocation, Linear programming, Operations research, Optimization.
Identifiers: *Sensitivity analysis, Objective function, Information decision, Decision theory.

The applicability of sensitivity analysis to decision making under risk is considered. Sensitivity analysis tests the responsiveness of model results to changes in parameter values and offers information for appraising the relative risk among alternative courses of action. This method is applicable to operating decisions and provides guidelines for allocating organizational resources to data collection activities as well. Applications of sensitivity analysis to both operating and information decisions are presented. The author uses a linear programming model to illustrate the risk analysis and information economics applications of sensitivity analysis. The relationship between sensitivity analysis and the statistical decision theory approach to information decisions is outlined. This essay is relevant to water studies concerned with the role of uncertainty in project evaluation. (See also W71-05953) (Siegenthaler-Rutgers)
W71-05955

MEASURING EFFICIENCY IN GOVERNMENT SERVICES,
York Univ. (England).
J. P. Hutton.
In: Quantitative Analysis in Public Finance, New York, Praeger Publishers, p 91-109, 1969.

Descriptors: *Economic efficiency, *Government, *Resource allocation, *Cost-benefit analysis, Sewage, Social aspects, Management, Transportation, Technology.
Identifiers: *Productivity, *Input-output analysis, Growth, Employment, Stability, Price, Scarcity.

This paper discusses various aspects of the measurement of efficiency in government services, indicating the problems associated with measuring the aggregate productivity despite the accepted infrastructure of roads, sewage and water, police, and the like. The process of measuring such productivity is likened to retrospective cost benefit analysis. The notions of efficiency under various titles such as price, technical, overall, and managerial efficiency are dealt with in their relation to decision-making in resource or service areas. Some techniques of analysis are surveyed in both state and local government contexts, citing the particular difficulties of measuring quality in productivity. Various resources are used as examples of what to expect in an optimal resource allocation situation. The problems of administration and data are also discussed, following which G. Hauser comments on the entire efficiency problem. This article is particularly relevant to issues in allocation difficulties and is consequently valuable to water resource researchers. (Murphy-Rutgers)
W71-05957

THE ROLE OF INCENTIVES, PENALTIES, AND REWARDS IN ATTAINING EFFECTIVE POLICY,
Brookings Institution, Washington, D.C.
Charles L. Schultze.
In: Public Expenditures and Policy Analysis, Chicago, Markham Publishing Company, p 145-172, 1970.

Descriptors: *Decision making, *Water pollution, *Natural resource allocation, *Government, Investment, Budgets, Flood control, Waste treatment, Dams, Sewers, Effluents, Taxes.
Identifiers: *Incentives, *Public expenditure policy, Program design, Program execution.

The problem of incentives in the formulation of public expenditure policy is surveyed. This problem arises because such decision-making results from the joint action of many independent decision-makers, and the fact that public programs are increasing rapidly in both scope and complexity, embracing such matters as urban rehabilitation, air and water pollution control, and development of depressed areas. The problem of incentives is regarded as an aspect of social behavior to be considered at every stage of public policy formulation, including formation of objectives, program design and resource allocation. The various types of incentives which appear relevant in such policy formulation are treated and include incentives which result in rechanneling actions towards greater efficiency. Finally, some of the theoretical and political problems which arrive in applying incentive concepts to public expenditure programs are discussed. This article is relevant to those interested in the maximization of federal investment programs involving resource allocation. (Murphy-Rutgers)
W71-05959

INSTITUTIONAL OBSTACLES TO REAL-LOCATING GOVERNMENT EXPENDITURES,
Washington Univ., St. Louis, Mo.
Murray L. Weidenbaum.
In: Public Expenditures and Policy Analysis, Chicago, Markham Publishing Company, p 232-245, 1970.

Descriptors: *Cost-benefit analysis, *Government, *Welfare economics, *Resource allocation, Social aspects, Budgets, Taxes, Investment, Financing, Decisionmaking.
Identifiers: *Institutional obstacles, Fixed charges, Controllability, Social insurance, Policy decisions.

This article considers the major obstacles to making improvements in allocating public resources operational, with special attention to those constraints that limit the discretion of governmental policymakers. This goal is achieved through a study of the techniques of governmental budgeting which highlights the substantive issues involved in the allocation of government resources. The basic explanation is presented in terms of the differences in the relative controllability, the appropriations review process, and the different types of government spending programs. Among the changes proposed to reduce institutional obstacles to effective resource allocation are a review of the necessity for numerous established trust funds, a reevaluation of the need for various permanent and indefinite appropriations, a reexamination of the 'fixed charges' on the budget, and a greater focus on the new starts of construction and other long term projects. The content of this article holds particular interest to those concerned with the allocative efficiency of government water resource investment. (Murphy-Rutgers)
W71-05961

PROJECT DESIGN AND EVALUATION WITH MULTIPLE OBJECTIVES,
Bowdoin Coll., Brunswick, Maine.
A. Myrick Freeman, III.
In: Public Expenditures and Policy Analysis, Chicago, Markham Publishing Company, p 347-363, 1970.

Descriptors: *Decision-making, *Cost-benefit analysis, *Economic efficiency, Flood control, Transportation, Spillover, Wastes, Municipal water, Income.
Identifiers: *Multiple objectives, *Public expenditures, *Weighting functions, Externalities, Valuation techniques, Constraints.

The problem of allocating limited government budgets among competing programs is surveyed. The problem is basically one of valuation; namely, assigning meaningful prices to all benefits. It is also indicated that choice among different kinds of benefits is unavoidable in the (either/or) allocation procedure under discussion and that a one-to-one relationship exists between the choices and relative values for different benefits. When values are not generated by market behavior, it is suggested that values be considered in the form of explicit weighting or social welfare functions for decision-making purposes, although such weighting functions cannot be inferred from observed choices among public expenditure programs. It is proposed that such functions should be based on consideration of legislative intent, guidelines in law and precedent, and subjective evaluations by politically responsive decision-makers. All these procedures are most likely to be successful if the initiative comes from executive agencies and is used in areas of established programs and repeated decisions. These criteria make the proposed design and evaluation methods of benefit estimation especially relevant to the water area. (Murphy-Rutgers)
W71-05962

THE ABSENCE OF KNOWLEDGE OF DISTRIBUTIONAL IMPACTS: AN OBSTACLE TO EFFECTIVE POLICY ANALYSIS AND DECISIONS,
Michigan State Univ., East Lansing.
James T. Bonren.
In: Public Expenditures and Policy Analysis Chicago, Markham Publishing Company, p 246-270, 1970.

Descriptors: *Water resource development, *Government, *Cost-benefit analysis, Capital costs, Investment, Decision-making, Social aspects, Taxes, Income, Irrigation, Statistics.
Identifiers: *Distributional impacts, *Public programs, *Higher education, *Farm program.

The distributional consequences of public decisions have major and increasingly important impacts in our society. Little is known about the distributional impacts of public programs, the social processes by which such impacts are institutionalized, or how to redesign distributional systems without incurring excessive political or social costs. It is proposed that increased efforts to obtain data for program analysis of the distributional impacts of public decisions is prerequisite to the desired efficiency of such decision-making and the integrity of public commitments in equity. Examples of education, water resource development, and the farm program are utilized in indicating the many unintended consequences which may result from public decisions in which no data had been systematically collected on distributional impacts. Working from the objectives given in the article, past decisions in the three areas cited are pointed out as lacking in economic and social wisdom. (Murphy-Rutgers)
W71-05963

EXTERNALITIES, INFORMATION AND ALTERNATIVE COLLECTIVE ACTION,
Northwestern Univ., Evanston, Ill.; and Carnegie-Mellon Univ., Pittsburgh, Pa.
Otto Davis, and Morton Kamien.
In: Public Expenditures and Policy Analysis, Chicago, Markham Publishing Company, p 74-95, 1970.

Descriptors: *Cost-benefit analysis, *Technology, *Optimization, Natural resource development, Water pollution, Sewage, Capital, Costs, Fishing, Government, Taxes, Social aspects.
Identifiers: *Externalities, *Pareto optimality, Collective action, Welfare economics, Information.

This article amplifies the major conclusion of modern welfare economics which can be viewed as a theorem concerning the allocation of resources by a market mechanism. Particular attention is given to the basic assumptions underlying this theorem. The criterion, the market and optimality are discussed as are problems associated with externalities. Various possible solutions are discussed

in terms of their potential effectiveness. Some of these are solutions by prohibition, directive, voluntary action, taxes and subsidies, regulation, payment, or action. These are all presented to deal with problems of technological externalities. It is proposed that the tools of cost benefit analysis provide the proper perspective for a policymaker attempting to attain an acceptable allocation of limited resources, such as water. (Murphy-Rutgers)
W71-05964

THE TREATMENT OF RISK AND UNCERTAINTY,
California Univ., Los Angeles.
Jack Hirsbleifer, and David Shapiro.
In: Public Expenditures and Policy Analysis, Chicago, Markham Publishing Company, p 291-313, 1970.

Descriptors: *Risk, *Uncertainty, *Cost-benefit analysis, Economic efficiency, Income, Investment, Government, Technology, Decision-making, Costs, Social aspects, Prices, Taxes, Pooling.
Identifiers: *Certainty-equivalent value, *Time-state preference, Externalities, Expected value, Risk aversion, Time preference, Market equilibrium.

Risk and uncertainty in the analysis of public investment decisions is considered. The analysis is discussed within the framework of cost-benefit principles, the efficiency criterion and dollar values reduction. Risk is considered as a suggestion of the potential variability of the objective configuration of events, while uncertainty labels the subjective lack of knowledge about the configuration results. Risk is considered both as a concept of expected value and as a concept of the certainty-equivalence value of an uncertain outcome in government decision making. A riskless case is presented, and a review is made of risk-aversion literature on cost-benefit analysis for public investment decisions. Past and present government practices are surveyed to indicate the wide variety of decision rationales. The model of time-state preference is shown as a theoretical advance in the direction of an exact theory of risk, leading to the present certainty-equivalent value criterion as a generalization of present value criterion applicable. This article should be of use as a review and extension of the analysis of risk and uncertainty for water resource investment decision-making. (Murphy-Rutgers)
W71-05965

RESCUING POLICY ANALYSIS FROM PPBS,
California Univ., Berkeley.
Aaron Wildavsky.
In: Public Expenditures and Policy Analysis, Chicago, Markham Publishing Company, p 461-481, 1970.

Descriptors: *Cost-benefit analysis, *Decision-making, *Planning, *Budgeting, Government, Risk, Health, Economic efficiency, Income.
Identifiers: *Policy analysis, *PPBS, Incentives, Inertia, Creativity, Defense.

Aspects of providing the information which contributes to politically and socially relevant decision-making are considered. This is achieved through evaluation of alternative means and ends in pursuit of suitable policy recommendations and through the sustained application of intelligence and knowledge to social problems. This article proposes that the traditional planning-programming-budgeting system has brought great damage to effective policy analysis, citing the special difficulties of inertia, personnel and the lack of trained personnel. In order that policy analysis prospers, the author suggests that top management must desire such analysis and the incentives must be increased for the suppliers of such analysis. The need for reexamination of critical aspects of policy analysis is indicated, citing the example of water resource projects. This article is relevant to those involved in water resources policy analysis. (Murphy-Rutgers)
W71-05968

THE DEMAND FOR LEISURE,
New School for Social Research, New York.
For primary bibliographic entry see Field 06D.
W71-05970

INSTITUTIONAL FACTORS INFLUENCING WATER DEVELOPMENT IN TEXAS,
Texas A and M Univ., College Station. Water Resources Inst.
Warren L. Trock.
Available from NTIS as PB-198 090, $3.00 in paper copy, $0.95 in microfiche. Research Project Technical Report No TR-35, March 1971, 35 p, 6 tab, 37 ref. OWRR Project B-025 TEX (7).

Descriptors: *Institutions, *Planning, Irrigation, *Water rights, *Irrigation districts, *Interbasin transfers, Cost sharing, Water law, Water administration, *Districts, *Texas.

Attention has been given to institutions which are important to (1) the implementation of the Texas Water Plan, and (2) the efficient use of water resources in irrigation in the lower Rio Grande Valley. Numerous political and economic institutions must be changed or newly developed to provide for (1) the interbasin diversions proposed by the Texas Water Plan, (2) the creation and management of transfer systems and (3) distribution of water within importing areas and fulfillment of financial obligations. These will be expressed by individuals and groups various points of view relative to water developments and the administration of water supplies. Self interests will be forcefully expressed. Competing users of water will make themselves heard. Institutional arrangements to resolve conflicts, to provide for development of water systems and to insure efficient use of water will be critical to the success of the Plan. Institutions of particular importance to efficient distribution and use of water in irrigation in the lower Rio Grande Valley are the irrigation districts and their policies and operations plus water rights. While operations of districts could significantly be influenced by consolidation of districts, rehabilitation, and changed managerial policies, there are important barriers to such change. Present low costs of water in districts and the desire to maintain control of irrigation systems policies and procedures in local districts may not allow change to take place. Negotiable water rights are a possibility, and exchange of rights or annual allocations would improve efficiency of water use. District members need to be made aware of consequences of such a change in this institution. An informational program relative to water management would be helpful.
W71-05972

RURAL WATER DISTRICTS--HERE IS WHY THEY ARE NEEDED,
Nebraska Univ., Lincoln. Agricultural Experiment Station.
Grant I. Johnson.
Quarterly Serving Farm, Ranch and Home, Spring 1970, Vol 17, No 1, p 20-23.

Descriptors: *Water districts, *Water supply, *Water management (Applied), *Cooperatives, *Rural areas, Exploration, Water wells, Legislation, Water distribution (Applied), Economic impact, Limiting factors, Surface water, Groundwater, Nebraska, Water demand.
Identifiers: *Rural water districts, Pawnee County (Neb), Johnson County (Neb), Richardson County (Neb), Nemaha County (Neb), Semi-arid lands.

Much of a 4-county semi-arid rural area of southeastern Nebraska suffers from limited ground and surface waters, and from highly mineralized groundwater. Pawnee, Johnson, Richardson and Nemaha Counties have been economically damaged as water restricts town, farm and ranch growth. Rural water districts (RWD) may be the solution to this problem. RWD, similar to rural electric districts, will provide water to subscribers, as authorized by the legislature as LB 896 in 1967. Preliminary work divides Nemaha County into 12 water districts which may operate economically. Four more RWDs are being developed. Surveys indicate county-wide water needs. Of six wells drilled in 1967 from 130 to 250 feet, only 1 produced water at the rate of 1/4 gallon per minute. Economic feasibility studies are needed, and dependable sources of good quality water require expensive exploration. Cooperative water-resource development may be necessary in other water-deficient areas. (Popkin - Arizona)
W71-06061

WATERFRONT LAND USE IN THE AUSTRALIAN STATE CAPITALS,
Victoria Univ., (British Columbia). Dept. of Geography.
Charles N. Forward.
Supported by Canada Council. Association of American Geographers, Annals, Vol 60, No 3, p 517-532, September 1970. 13 fig, 3 tab, 6 ref.

Descriptors: *Land use, *Cities, *Harbors, Recreation, Industrial plants, Ships, Planning, Legal aspects, Social aspects, Land classification, Land development, Zoning, Urbanization, On-site investigations.
Identifiers: *Waterfronts, *Australia.

Waterfront land in port cities is subject to a variety of uses, many of them conflicting. Such land is generally more valuable than that immediately inland, but its significance has not been fully appreciated by urban administrations or planning departments. Physical aspects and land uses, both esthetic and economic, were investigated in the 6 Australian capital cities, Sydney, Melbourne, Brisbane, Adelaide, Perth and Hobart. Most of the Australian population lives along a crescenteric coastal swath between Brisbane and Adelaide. All are important ports in terms of shipping tonnage handled. Hobart, the capital of Tasmania lies outside the swath and is the least important in shipping and population. Adelaide and Perth are both central places for vast arid interiors. Land uses were mapped according to a standard industrial classification to ensure comparability between cities. Although the existence of 2 distinct groups emerged in terms of harbor land usuage, this distinction could not be accounted for by obvious variations among cities such as population, economic functions or waterfront land mileage. Instead, the answer seems to lie in harbor characteristics. Sydney, Brisbane and Hobart are all on broad estuaries that provide ample waterfront space, and contiguous land is characterized by a wide variety of uses, including residential areas. Melbourne, Adelaide and Perth are several miles from the ocean, on small rivers, and waterfront land is therefore much more limited. Waterfront land use is dominated by recreational categories, mainly parks. Planning of waterfront land use should be carried out on a metropolitan basis to ensure rational and efficient utilization of the resource. (Casey - Arizona)
W71-06065

COMMUNITY FACILITIES PLAN; WATER AND SEWER PLAN; PUBLIC IMPROVEMENTS PROGRAM AND CAPITAL BUDGET, DECHERD, TENNESSEE.
Dechard Municipal Planning Commission, Tenn.

Available from NTIS as PB-195 653, $3.00 in paper copy, $0.95 in microfiche. Dechard Municipal Planning Commission Report, Feb 1970. 23 p. HUD Grant Tenn P-119.
Identifiers: *Urban planning, *Tennessee, Education, Recreation, Fire protection, Police, Public utilities, Public health, *Decherd, Tennessee.

The Decherd Community Facilities Plan evaluates the local public facilities in terms of their adequacy to serve the present and projected population of the City. It includes an inventory and analysis of the educational, recreational, protective public works, health and other community facilities in Decherd.

W71-06105

NORTH CAROLINA WATER PLAN PROGRESS REPORT CHAPTER 6, RESEARCH (DRAFT).
North Carolina State Dept. of Water and Air Resources, Raleigh.

North Carolina Department of Water and Air Resources Water Plan Progress Report, Chapter 6, December 1970. 75 p, 89 ref. OWRR Project A-999-NC (20).

Descriptors: *Water resources development, *Planning, *Research facilities, *North Carolina, Evaluation, Federal Government, State government, Local governments, Industries, Grants, Administration, Allotments, Water law, Water policy, Programs, Water pollution control, Abatement, Land use, Water demand, Water quality control, Recreation.
Identifiers: *North Carolina Water Plan.

This report is a review draft of chapter 6 which is a part of one of three stages of the overall North Carolina Water Plan. Included in this review are National Assessment of Water Resources Research Needs; Water resources Problems and Research Needs in North Carolina; Water Resources Research in North Carolina Supported by Federal Agencies; Water Resources Research in North Carolina Performed by Federal Agencies; Private Industry Research in North Carolina; State Government Operating Agency Research in North Carolina; Non-Profit Institute Water Research in North Carolina; Water Resources Research Institute; Institute of Government of the University of North Carolina; Office of Marine Sciences; and University Community at Large. A bibliography of published reports of the North Carolina Water Resources Research Institute is included. (Woodard-USGS)
W71-06116

SAFE YIELD OF AQUIFERS: AN ECONOMIC REFORMULATION,
Resources for the Future, Inc., Washington, D.C.
Robert A. Young.
ASCE Proceedings, Journal of the Irrigation and Drainage Division, Vol 96, NoIR 4, p 377-385, December 1970. 9 p, 24 ref.

Descriptors: *Safe yield, *Cost-benefit analysis, *Optimization, Water conservation, Groundwater, Water resources development, Water yield, Water yield improvement, Pumping, Aquifers.
Identifiers: Groundwater resources.

Concepts of safe yield of groundwater reservoirs have been criticized by hydrologists as ambiguous, pseudohydrologic and overly limited in scope. From the perspective of economics, these difficulties stem from application of an essentially descriptive (factual) concept to the prescriptive (normative) problem of resource allocation. From the theory of optimal resource allocation in economics, it is shown that groundwater basin management becomes an issue of public concern because of the existence of technical conditions which prevent the market mechanism from properly functioning in the allocation of groundwater. The rules for allocating groundwater implicit in the prescriptive definition of safe yield are addressed to significant issues, problems which are termed external diseconomies in economics. However, these rules are deficient in that they focus on costs of groundwater withdrawals while ignoring associated benefits. The objective of maximizing net economic yield (the present value of social benefit minus social costs) is suggested as an alternative to safe yield criteria for groundwater basin management. (Knapp-USGS)
W71-06126

MARGINAL COSTS OF ALTERNATIVE LEVELS OF WATER QUALITY IN THE UPPER MISSISSIPPI RIVER,
Minnesota Univ., St. Paul.
For primary bibliographic entry see Field 05G.
W71-06191

SUSQUEHANNA RIVER BASIN STUDY (SUMMARY),
W. J. Love.
Susquehanna River Basin Study Coordinating Committee Report, June 1970. 155 p, 56 fig, 27 tab.

Descriptors: *River basin commissions, *Investigations, *Water Resources Planning Act, *River basin development, *Planning, Watershed management, Multiple-purpose projects, Evaluation, Economic impact, Appraisals, Data collections, Environmental effects, Acid mine water, Water pollution control, Water requirements.
Identifiers: *Susquehanna River basin, Coordinating committee report, Long-range Framework Plan.

An illustrated summarization is given of a 6-yr study of the Susquehanna River Basin, begun in 1963 by a coordinating committee of representatives from the Department of Agriculture; Army; Commerce; Health, Education and Welfare; Housing and Urban Development; and the Interior; the Federal Power Commission; the States of New York, Maryland, and Pennsylvania. The collection and analysis of data and the formulation of a plan for achieving the stated objectives are described. The objectives were to evaluate the water resources potential of the Basin, determine water needs of the increasing population, analyze alternative solutions, recommend programs necessary to manage the water resources to meet the economic and social needs of the people, and to preserve the Basin's high natural values for present and future generations. The Susquehanna drains a 27,500 sq mi area, 6,300 in New York, 20,900 in Pennsylvania, and 300 in Maryland. The river flows through intensively developed industrial areas, farm lands, and large forests with an average discharge of 25 bgd. Flow rate varies widely, from a low of 1 bgd in September 1932 to a high of 536 bgd (830,000 cu sec) in the March 1936 flood. The health and well being of the Chesapeake Bay above the mouth of the Potomac River is dependent upon the Susquehanna, which furnishes 85% of the fresh water that enters the Bay. (Lang-USGS)
W71-06227

YORK RIVER BASIN COMPREHENSIVE WATER RESOURCES PLAN-VOLUME 1, INTRODUCTION.
Virginia Dept. of Conservation and Economic Development, Richmond. Div. of Water Resources.

Virginia Division of Water Resources Planning Bulletin 225, Ocotober 1970. 112 p, 21 plate, 13 tab, 21 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Virginia, Watersheds (Basins), Evaluation, Hydrologic data, Climatology, Meteorology, Hydrology, Geology, Economics, Waste water (Pollution), Recreation, Agriculture, Irrigation, Impoundments, Industries, Streams, Water resources development, Planning, Navigation, Water quality.
Identifiers: *York River basin (Virginia).

The York River basin, located in the central and eastern section of Virginia, has an estimated population of 117,000 in an area of 2,661 square miles. The basin is re-examined in light of its latest growth, to project the economy of the area to the year 2020 and to determine the quantitative and qualitative water needs of the area for the future as well as for the present. The reports of the study will be contained in six volumes. This report, Volume 1, is designed to acquaint the reader with the York River basin and to present factual data relevant to the basin. The history and the natural and economic characteristics of the major political subdivisions of the basin are outlined. Other subjects discussed are the basin's water development history, existing power supply, navigation geology, mineral resources, groundwater, municipal and industrial water supply, agriculture and recreation. Drainage area data for the major rivers in the basin and their tributaries are tabulated. (Woodard-USGS)
W71-06230

YORK RIVER BASIN COMPREHENSIVE WATER RESOURCES PLAN, VOLUME III-HYDROLOGIC ANALYSIS,
Virginia Dept. of Conservation and Economic Development, Richmond. Div. of Water Resources.

Virginia Division of Water Resources Planning Bulletin, November 1970. 130 p, 56 plate, 18 tab, 16 ref.

Descriptors: *Water resources development, *Virginia, *Surface waters, *Groundwater, *Hydrologic data, Data collections, Planning, Meteorological data, Rainfall-runoff relationships, Streamflow, Flow rates, Low flow, Peak discharge, Flood forecasting, Aquifers, Aquifer characteristics, Water wells, Water quality, Chemical analysis, Hydrology, Geology.
Identifiers: *York River Basin (Virginia).

The Comprehensive York River Basin Water Resources Plan in Virginia will be contained in six volumes. This report (Vol. 3) presents data and discussions of surface-water runoff, groundwater supply, climate and meteorology. Tables and plates illustrate the mean and the extremes of precipitation, temperature and other climatological data. A brief resume of this data and the history of weather conditions are included. The program for collection of surface-water runoff data is given with an explanation of how the data may be used. Curves are developed through various analytical methods to determine the probable return period in years for specified low flow intervals; an analysis is made of flow duration to determine the percent of time a specified flow will be equaled or exceeded; and curves are developed to determine the frequency of floods on a regional basis. The lithology and hydrology of geologic aquifers are discussed and related to potential groundwater availability. Data on groundwater wells are analyzed; the quality of groundwater is summarized; and plates and tables illustrate the groundwater potential for planning pruposes. (See also W71-06230) (Woodard-USGS)
W71-06231

AN ECONOMIC ANALYSIS OF THE INTERTEMPORAL ALLOCATION OF GROUNDWATER IN THE CENTRAL OGALLALA FORMATION,
Oklahoma State Univ., Deot. of Agricultural Economics.
For primary bibliographic entry see Field 04B.
W71-06266

THE BUREAU OF RECLAMATION'S ROLE IN AMERICA'S GROWTH,
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-06308

A CRAZY IDEA ON URBAN WATER MANAGEMENT,
Pennsylvania State Univ., Unversity Park. Dept. of Civil Engineering.
Sie Ling Chiang.
Water Resources Bulletin, Vol 7, No 1, p 171-174, February 1971. 2 fig.

Descriptors: *Water resources, *Water management (Applied), *Cities, *Storm runoff, Hydrology, Flood control, Groundwater recharge.
Identifiers: *Metropolitan water resources management, *Urban water management, *Rooftop storage, Urban hydrology.

High percentage of imperviousness in the city is the source of storm runoff. Roof area contributes significantly to the imperviousness. An attempt to

make use of roofs as urban flood control device and water conservation measure is advocated. Two different schemes, one for built-up industrial-commercial area, the other for residential area, are suggested. The former utilizes the roof as detention reservoir for flood control, the latter employs recharge pit to convert runoff into groundwater resource. The proposed schemes are not only hydrologically, hydraulically and structurally sound but also economically feasible. It is worth considering in the future planning of urban renewal and urban development. (Davis-Chicago)
W71-06309

LAND USE FUNCTION IN WATER QUALITY MANAGEMENT,
North Carolina Water Resources Research Inst., Raleigh.
David H. Howells.
Water Resources Bulletin, Vol 7, No 1, p 162-170, February 1971. 17 ref.

Descriptors: *Land use, *Water quality, *Water quality control, Water policy, Land management, Water pollution control, Standards, Regulation, Runoff.
Identifiers: *Water quality management, *Land use policy, Land use control.

The Nation has entered a new era of water quality management in which land use policy and regulation must assume an increasingly important role. The benefits of tertiary and advanced waste treatment may be offset by contradictory land use and pollution from land runoff. Unless land use planning and controls are included in water quality management, land-imposed constraints on water quality can be anticipated. Pollution from major types of land runoff are reviewed with respect to sources, effects, and control procedures. Emphasis is given to land use practices and controls. The crucial issue with regard to the latter is lack of land use policies at federal, state, and local levels. State legislation establishing guidelines and minimum standards for land use regulation by local government is required. The dependency of water quality on land use points to the fallacy of attempting to provide for comprehensive water pollution control outside the context of comprehensive land-water resources planning and management. (Davis-Chicago)
W71-06310

ECONOMIC DESIGN OF CENTRAL WATER SUPPLY SYSTEMS FOR MEDIUM SIZED TOWNS,
Illinois State Water Survey, Urbana.
Krishan P. Singh.
Water Resources Bulletin, Vol 7, No 1, p 79-92, February 1971. 4 fig, 2 tab, 7 ref.

Descriptors: *Water supply, *Cities, *Costs, Networks, Network design, Pipelines, Interbasin transfers, Urbanization, Pumping plants, Design.
Identifiers: *Water supply systems, *Economic design, Conveyance cost.

Adequate and good quality water supply for medium sized towns is costly when there are insufficient quantity and low quality of groundwater or surface water. In a central water supply system serving a number of towns, the economics of scale may permit a sufficient and good quality supply at lesser rates. Such a system has the flexibility of supplying rural population through small service lines. The system may be an interbasin or intrabasin conveyance depending on the location of a suitable water source and the economics of the supply network. Seven cost elements are pertinent to the optimum or least-cost design of network consisting of pipelines and pumping stations. The relevant cost functions are based on the available data gathered from various sources. Water conveyance costs are calculated for various flow rates, pipeline diameters, flow variabilities, static heads, and interest rates, thus providing a measure of sensitivity of the conveyance cost to such variations. The economics of scale, the sensitivity of optimum unit conveyance costs, and variations in unit costs with change in cost functions are useful in making a feasibility study for a proposed conveyance system. (Davis-Chicago)
W71-06312

MEASURING INTANGIBLE BENEFITS--SOME NEEDED RESEARCH,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
J. B. Wyckoff.
Water Resources Bulletin, Vol 7, No 1, p 11-16, February 1971. 19 ref.

Descriptors: *Methodology, *Research and development, *Intangible benefits, Cost-benefit analysis, Costs, Benefits, Aesthetics, Measurement, Analytic techniques.
Identifiers: *Water project analysis, Multiple objective functions, Tradeoff models.

Society has long sought to maximize the welfare of its members by allocating its limited resources so as to provide maximum satisfaction. As long as all of the values that society gains or loses are measured in the market place in terms of price, the process of maximizing through economic models is relatively straightforward. However, the total value that society receives from the use of its resources is not completely measured through the private market transactions. There are some values created which are external to the market system. The resulting underinvestment in natural resources by the private sector necessitates the entry of the public sector. The presence of intangible benefits and intangible costs has long been recognized, but completely satisfactory methods for including these in the quantitative analysis of benefit-cost have not been developed. Some progress has been made in including recreational values in project analysis via the expenditures method, the Gross National Product method, consumer surplus method, cost method, market value method, and monopoly and discriminating monopoly methods, but little has been done in the area of aesthetic values. Techniques for including such values in project analysis need to be further researched. Tradeoff models developed by market researchers, the advertising industry, social psychologists and sociologists may have some applicability. Moethodology for including proposed multiple objective functions in project analysis is also a critical need. (Davis-Chicago)
W71-06313

WATER RESOURCES MANAGEMENT IN THE PUBLIC INTEREST,
New York State Dept. of Environmental Conservation, Albany.
Terence P. Curran.
Water Resources Bulletin, Vol 7, No 1, p 33-39, February 1971. 18 ref.

Descriptors: *Water resources development, *Planning, *Social aspects, *Decision making, Political aspects, Social values, Ethics.
Identifiers: *Water resources management, *Public interest, Public participation, Planning objectives, Political ethics, Interest groups.

The water resources manager, concerned with providing for citizen needs in all its varied aspects, is obliged to consider the public interest in his decision making. But the public interest, although inferring the superiority of public over purely private interests, is more of a concept of political ethics than an operational objective. Recent attacks on water resources developments place in question just how responsive the water resources manager has been to the public at large during the planning process. The recent broadening of planning objectives beyond economic efficiency to include greater attention to social goals is an encouraging development. Efforts should be expanded toward greater citizen participation and more attention should be given to sampling surveys to determine citizen attitudes on water resources proposals. In the last analysis, the decision-making process must combine the expertise of the water resources manager and the participation of the people through the political process. (Davis-Chicago)
W71-06314

PUBLIC PARTICIPATION IN WATER PLANNING: A CRITIQUE OF THEORY, DOCTRINE, AND PRACTICE,
Colorado State Univ., Fort Collins. Dept. of Political Science.
Norman Wengert.
Water Resources Bulletin, Vol 7, No 1, p 26-32, February 1971. 1 fig, 14 ref.

Descriptors: *Water resources development, *Planning, *Methodology, *Decision making, Political aspects, Political constraints, Institutions.
Identifiers: *Public participation.

Water development planning has virtually since its beginnings over one hundred fifty years ago utilized a variety of devices for involving segments of the public. But a new insistence for increased public participation, particularly at the Federal level, has stimulated re-examination of objectives and methods for relating water planning to citizen interests and preferences. Involved is partly a recommitment to democratic symbols, partly a recognition that segments of society have been overlooked, and partly a reaction to the pressures of confrontation and demonstration. The rhetoric and polemics of participation have often impled a king of 'town-meeting' process of decision, difficult at best in a nation of 200 million. In water planning more emphasis has been placed on listening to citizens, which has meant providing opportunities for influentials to express their views and preferences. A more adequate approach would seem to require identification of all who are significantly affected by plans and proposals (even though they may not perceive their interest). But gaining greater participation does not make the planning job easier. It may increase tension and conflict; it may require difficult choices; and it can later existing power relationships and generate changes with considerable consequences for the agency and its programs. (Davis-Chicago)
W71-06315

IMPROVING WATER RESOURCE ALLOCATION THROUGH DEMAND-ORIENTED WATER POLICY,
Texas A and I Univ., Kingsville. Dept. of Economics.
Ronald D. Finster.
Water Resources Bulletin, Vol 7, No 1, p 17-25, February 1971. 1 tab, 4 ref.

Descriptors: *Water allocation (Policy), *Water policy, *Water supply, *Water demand, Economics, Regions, Regional analysis, Arizona, Resource allocation, Inter-basin transfers, Arid lands.
Identifiers: *Demand-oriented water policy.

In the arid and semi-arid regions of the Western United States the water problem is generally perceived as one of 'inadequate' supply. This conception of the problem engenders supply-oriented water policy, or policy focusing exclusively upon a single class of solutions - the various schemes for augmenting an area's water supply. In a more complete or balanced conceptualization, the water problem is viewed as one of 'inadequate' supply and/or 'excessive' demand. When the water problem is so conceived, water policy is broadened to include demand-oriented water policy, or policy aimed at reducing the quantity of water demanded in an area. The purpose of this paper is to describe and explain demand-oriented water policy. Basically it consists of changing the set of commodities produced by the economy, cutting back and/or eliminating goods requiring large quantities of water in their production and introducing and/or expanding goods which require little water. This paper also reports briefly on research undertaken

test demand-oriented policy in Arizona. Results indicate that such a policy can be extremely efficacious in solving a region's water problem. (Davis-Chicago)
W71-06316

COLOGY AND SPATIAL ANALYSIS,
Michigan Univ., Ann Arbor. Dept. of Geography.
For primary bibliographic entry see Field 06F.
W71-06317

CONOMIC ASPECTS,
owa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W71-06447

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

A CRITICAL SURVEY OF USE OF COST-BENEFIT ANALYSIS IN PUBLIC FINANCE,
Turin Univ. (Italy).
Bruno Contini.
In: Quantitative Analysis in Public Finance New York, Praeger Publishers, p 65-89, 1969.

Descriptors: *Cost-benefit analysis, *Irrigation, Economic efficiency, *Flood control, *Model studies, *Forecasting, *Water treatment, Investment, Population, Weather, Marginal costs, Technology, Taxes, Costs, Recreation.
Identifiers: Partial equilibrium analysis, Income redistribution, Externalities, Consumer surplus, Opportunity costs, Health programs.

This article discusses the basic uses of cost-benefit analysis in public finance. An analogy of a horse and rabbit stew is used to juxtapose the consequences that can be measured and evaluated numerically with an amalgam of external effects, social, emotional and psychological impacts, and historical and aesthetic considerations. It is assumed that the use of cost-benefit analysis is limited to use as a tool of partial equilibrium analysis, since the technique of such decision-making must be utilized within a framework that has been decided upon in advance. The need for cost-benefit analysis to handle both allocation and redistribution effects is considered in detail. Valuation of benefits is discussed using many examples in the water and natural resource areas. Timing difficulties are also analyzed, using certain applications in the context of water resource development. Costs are then similarly analyzed. Intangible effects of cost benefit analysis are also discussed with particular attention to problems of recreation, flood control systems, education, and health programs. This article provides a background discussion for cost benefit decision-making in the water resource area. (See also W71-05947) (Murphy-Rutgers)
W71-05948

THE FISCAL ECONOMIST AND QUANTITATIVE ANALYSIS,
York Univ. (England).
Alan T. Peacock.
In: Quantitative Analysis in Public Finance, New York, Praeger Publishers, p 3-11, 1969.

Descriptors: *Cost-benefit analysis, *Economic efficiency, *Government, Decision-making, Resource development, Budgets, Optimization, Social aspects, Statistics, Environment.
Identifiers: *Econometric techniques, Productivity analysis, Quantitative analysis, *Preferences, Resource growth, Inflation, Public goods.

This article briefly summarizes several studies on quantitative analysis and relates their content to the various stages of the process of formulating and executing policies through the system of public finance. The use of cost benefit analysis as a means of project appraisal in the resource area is studied in light of the ultimate goal of efficiency. Particular attention is given to several aspects of this problem. Articulation of preferences is discussed as being typical of the recent development of nonmarket economics which utilizes economic concepts in analyzing community choices and their effects on public policy. Various hypotheses about government sector growth are presented as they relate to these consumer preferences. Extensive treatment of cost-benefit and efficiency analysis is presented, both from the viewpoint of mathematical constructs and statistics and from the viewpoint of correct specification of the economics underlying such appraisals. This article is relevant to water studies in presenting the recent extension of economic analysis to non-market phenomena in the public finance area. (Murphy-Rutgers)
W71-05956

COLLECTIVE ACTION AND THE DISTRIBUTION OF INCOME: A CONCEPTUAL APPROACH,
Wisconsin Univ., Madison.
Burton A. Weisbrod.
In: Public Expenditures and Policy Analysis Chicago, Markham Publishing Company, p 117-141, 1970.

Descriptors: *Income, *Government, *Cost-benefit analysis, *Economic efficiency, Taxes, Flood control, Economic evaluation, Government supports, Welfare economics.
Identifiers: *Resource allocation, *Economic stabilization, *Allocative efficiency, Income transfers, Criteria, Public policy, Poverty.

The income redistribution function of the federal government is considered as interrelated with the other government functions of allocative efficiency and economic stabilization. Topics treated include the ways by which government activities affect the distribution of income in the society, types of redistributional programs, criteria for judging such programs, and conflicts among the various criteria. Direct redistributive activities such as welfare payments are compared with indirect activities which also serve to redistribute income, such as tax policies. The direct and indirect consequences of economic stabilization policies and resource allocation policies on the distribution of income are also considered at some length, using the examples of education and flood-control policy. Six criteria by which such widespread effects of government on income distribution are then surveyed and various advantages and disadvantages of each are presented. The article is particularly useful in the cost-benefit analysis of income distribution effects resulting from water resource investments. (Murphy-Rutgers)
W71-05960

THE ORGANIZATION OF ECONOMIC ACTIVITY: ISSUES PERTINENT TO THE CHOICE OF MARKET VERSUS NONMARKET ALLOCATION,
Harvard Univ., Cambridge, Mass.
Kenneth J. Arrow.
In: Public Expenditures and Policy Analysis, Chicago, Markham Publishing Company, p 59-73, 1970.

Descriptors: *Natural resource allocation, *Cost benefit analysis, *Costs, Economic evaluation, Taxes, Government, Economic efficiency, Optimization, Risks.
Identifiers: *Externalities, *Competitive equilibrium, *Transaction costs, *Market failure, Collective action.

Various issues relevant to both market and nonmarket means of resource allocation are surveyed. The lack of precision in general market situations is cited, calling for exact relationships between such pertinent concepts as public goods, externalities, appropriability and exclusion. It is pointed out that the absence of conditions which assure a Pareto efficient competitive equilibrium situation usually results in resorting to nonmarket channels of resource allocation, such as government expenditures, taxes and subsidies. Externalities are also analyzed in terms of criteria, namely, benefit cost and second best analyses. The import of transaction costs on market failure is also discussed in some detail, particularly in relationship to monetary theory and in the identification of such costs in different contexts and under different systems of resource allocation. It is proposed that a wide variety of social institutions exist which serve as compensation for the failure or limitation of the market, although each of these involve transaction costs of their own. Economic analysis of these different contexts of choice is prerequisite to contemporary resource allocation. (Murphy-Rutgers)
W71-05966

A NOTE ON BIASES IN CAPITAL BUDGETING INTRODUCED BY INFLATION,
Stanford Univ., Calif.
James C. Van Horne.
Journal of Financial and Quantitative Analysis, Volume VI, Number 1, p 653-658, January 1971.

Descriptors: *Capital costs, *Budgeting, *Investment, Economic analysis, Decision-making, Risk, Financing, Prices, Debt, Prices.
Identifiers: *Inflation, *Capital allocation, Cost of capital rates, Acceptance criterion, Cash flows, Taxes, Price index.

The importance is considered of anticipating inflation in cash-flow estimates tend to eliminate the bias which arises due to the cost-of-capital rate generally used as the acceptance criterion. This article investigates the nature and origin of this bias. A hypothetical investment situation is proposed, which uses the cost-of-capital rate for project selection. In this situation, it is assumed that there is no capital rationing, that acceptance of the investment project will not alter risk complexion, and that the capital structure consists entirely of equity. A discussion of inflation is then presented and the need for incorporating an element of anticipated inflation is proven. It is also indicated that the correspondence of this element to the rate of anticipated inflation, as indicated by price index changes, depends upon the preference functions of investors relative to the price index employed. This article is valuable for use in reference to water resource investment projects, since it illustrates the importance of accounting for anticipated inflation in long-term decision-making. (Murphy-Rutgers)
W71-05969

6D. Water Demand

PROVIDING REASONABLE WATER SERVICE,
American Water Works Association, New York.
Abel Wolman.
In: Water, Health and Society, Bloomington, Indiana University Press, p 133-142, 1969.

Descriptors: *Water supply, *Water utilities, Economic analysis, *Water demand, Natural resources, Industrial water, Capital cost, Investment, Cost-benefit analysis, Water treatment, Reservoirs, Taxes, Financing, Population, Conservation.
Identifiers: *U.S. Geological Survey, *Water service, Inflation, Depression, Consumers.

This article presents common water consumer complaints and suggests reasonable water service to counteract these difficulties. The author begins by surveying water difficulties in the United States and several selected foreign countries such as Great Britain, Manila, and Japan. Among the causes of inadequate water service are scarcity of materials and manpower, inflation, increased per capita water use, rapid industrial expansion, population growth, metropolitan growth, public inertia, restrictions on increases in water rates, and prevailing waterworks opinion over the last half century. The nature of reasonable water service is proposed as consistent and continuously available water ser-

vice for all sensible water use demands. Several steps are proposed as preparation for achieving this reasonable water service, such as maintenance of continuing technical review, development of criteria of adequacy, development of public relations programs, reconciliation of costs and income, provision of machinery for metropolitan areas, and reexamination of improvement financing. The major problem cited is the economic aspect of water improvement programs and the cost and revenue problem is dealt with in some detail. (Murphy-Rutgers)
W71-05942

THE DEMAND FOR LEISURE,
New School for Social Research, New York.
John D. Owen.
Journal of Political Economy, Vol 79, No 1, p 58-76, January/February 1971.

Descriptors: *Recreation demand, Regression analysis, Price elasticity, Least squares method.
Identifiers: *Complementarity, *Demand for leisure, Income elasticity, Full income, Autocorrelation, Measurement error.

The relationship is considered between the demand for leisure time and the demand for market recreation, a closely related good. Complementarily between leisure time and market recreation is estimated empirically be regressing the demand for leisure time of U.S. employees from 1900-1961 on the relative price of recreational goods and services, holding real income and the relative price of leisure constant. The regression estimates support the hypothesis that leisure time and market recreation are complements with 25 percent of the estimated long term increase in demand for leisure explained by a decline in market recreation prices. Improvements in the estimation of the demand for leisure time were obtained when the price of recreation was used as a regressor and when the effects of changes in the unemployment rate on the demand for leisure is considered. This paper is relevant to water studies concerned with the demand for water-based recreational facilities. (Siegenthaler-Rutgers)
W71-05970

PUBLIC WATER FOR RURAL AREAS AND SMALL TOWNS,
Missouri Univ., Columbia. Dept. of Agricultural Economics.
Coy G. McNabb, and Melvin G. Blase.
Missouri University Cooperative Extension Division Report MP105, 1969. 12 p, 2 tab. OWRR Project No A-018-MO (2).

Descriptors: *Public utilities, *Water supply, *Missouri, *Rural areas, Water distribution (Applied), Water management (Applied), Water policy, Water utilization, Distribution systems.
Identifiers: Rural water systems.

The number of rural water supply systems in Missouri has increased since 1965, the year the Farmers Home Administration expanded its loan program for this purpose. FHA offers financial assistance to two general types of water distribution organizations, (1) municipal systems which include villages, towns, or cities with less than 5,500 population, and (2) rural districts. Problems and characteristics of districts which were in operation at the time of study are described. (Knapp-USGS)
W71-05973

COOLING WATER RESOURCES AND POWER GENERATION,
Southern California Edison Co., Los Angeles.
For primary bibliographic entry see Field 05G.
W71-06091

IMPROVING WATER RESOURCE ALLOCATION THROUGH DEMAND-ORIENTED WATER POLICY,
Texas A and I Univ., Kingsville. Dept. of Economics.
For primary bibliographic entry see Field 06B.
W71-06316

WATER REQUIREMENTS FOR MANUFACTURING,
Business and Defense Service Administration, Washington, D.C. Water Resources and Engineering Service Div.
K. L. Kollar, and R. Brewer.
Journal American Water Works Association, Vol 60, No 10, p 1129-1140, October 1968. 9 tab, 7 ref.

Descriptors: *Water requirements, *Census, Withdrawal, Treatment, Brackish water, Rates, Water reuse, Sea water, *Water utilization, *Industrial plants, *Industrial water.
Identifiers: *Source of water, *Recirculation, Economic projections, Large water-using manufacturers.

This is a statistical presentation of national developments in recent years in the industrial water usage field. Further, it lays down some basic guidelines which must be reasonably followed if the nation is to continue to develop and prosper with the relatively fixed amount of total water available. Some properties of large water-using manufacturers were discussed. The data indicate the source of the increased demands will be company-controlled surface fresh water sources and brackish supplies rather than wells or public water system. Treatment and uses of water in manufacturers were discussed. It was estimated that the overall recirculation rate was 1.10 and it was noted that higher recirculation rates were found in regions where water is least abundant. The relation between water consumption and manufacturing production was discussed. Tabulated data presents the projected series of important economic parameters and the quantities of manufacturing water associated with them. This paper pointed out an important trend of reuse of waste water and recirculation in manufacturing. (Wang-Rutgers)
W71-06318

WATER USE BY APPALACHIAN MANUFACTURERS,
Business and Defense Service Administration, Washington, D.C. Water Resources and Engineering Div.
K. L. Kollar, and R. Brewer.
Water use by Appalachian Manufacturers-1964, p 1-28, December 1967. 37 tab, 9 charts.

Descriptors: *Water use, *Appalachia, Profiles, Productivity, Census, Water costs, Value added, Water utilization, Industrial plants, Industrial water.
Identifiers: *SIC, Non-Appalachia, Recirculation ratio.

This is a report concerning the use of water by industries in Appalachia and the relationship of that use to other economic factors. The availability of water in Appalachia, manufacturing and U.S. economy, water use in U.S. manufacturing, manufacturing in Appalachia, and water use by Appalachian manufacturers were discussed. The scope of work involved the use of data from the 1964 Census of Manufacturers from those manufacturing establishments which use more than 20 million gallons of water annually. Special extractions of data were made to permit comparisons of establishments within Appalachia with those in non-Appalachia conterminous United States. Other economic data for the same year and geographic areas, such as employment, value added, value of shipments, water conservation by reuse and recirculation were presented. Profiles of selected industries included poultry and small game, paper mills, paperboard mills, alkalies and chlorine, plastic materials, blast furnace, iron and steel, and drugs were presented; water use in these industries were discussed. The large quantities of good quality water that are available can be utilized to further the industrial and economic development in Appalachia. (Wang-Rutgers)
W71-06319

6E. Water Law and Institutions

MCGEHEE V WILLIAMS (CONTRACT BETWEEN CITIES FOR PROVISION OF WATER).

87 SW2d 46-49 (Ark 1935).

Descriptors: *Arkansas, *Municipal water, *Water supply, *Contracts, Local governments, Water requirements, Reservoir construction, Reservoirs, Reservoir operation, Reservoir storage, Water use, Marketing, Utilities, Water works, Legal aspects, Cities, Judicial decisions.

Plaintiff taxpayers sought to enjoin the further performance of a contract between defendant cities Alma and Fort Smith. Alma had contracted to buy water from Fort Smith, which was building a new waterworks system. Plaintiff taxpayers contended that the contract was illegal, ultra vires, and void. Defendant cities demurred to the complaint, and the trial court sustained the demurrer. The Supreme Court of Arkansas held that the town of Alma had the power and authority to purchase water from any source and to contract to that effect. Fort Smith had the power to sell its surplus water to persons outside the city and to contract to that effect. The contract was not in violation of the Arkansas constitution. (Robinson-Florida)
W71-05836

DRAINAGE DIST NO 7 V HAVERSTICK (LIABILITY FOR DIVERSION OF NATURAL WATERCOURSE).
53 SW2d 589-593 (Ark 1933).

Descriptors: *Arkansas, *Drainage districts, *Alteration of flow, *Diversion, Damages, Floodways, Reservoirs, Dams, Levees, Flood control, River flow, Natural flow, Natural flow doctrine, Watercourses (Legal), Riparian rights, Local governments, State governments, Judicial decisions, Legal aspects, Flood routing, Floods, Flooding.
Identifiers: Statute of limitations.

Plaintiff landowner sued defendant drainage district for damages. Defendant had dammed a river, diverted its waters into an artificial floodway, and discharged the water into the river further downstream and opposite plaintiff's land, thereby submerging plaintiff's land. Defendant contended that the right to drain into a natural watercourse is not limited to the natural capacity of the stream. Defendant also contended that plaintiff had failed to bring suit within the statutory period. In affirming a trial court decision for plaintiff, the Supreme Court of Arkansas pointed out that the right to drain into a natural river was not involved, but rather the right to divert the natural flow of a river. A diversion of a river from its natural course, and the subsequent acceleration in its flow, is a proper ground for a damage suit. As plaintiff had brought suit while a dam and a reservoir were still in construction, they being an essential part of the drainage district improvement, the action was brought within one year after construction of the drainage system. (Smiljanich-Florida)
W71-05876

UNITED STATES V BIG HORN LAND AND CATTLE CO (FORFEITURE OF RIGHT-OF-WAY ON PUBLIC LAND).

17 F2d 357-366 (8th Cir 1927).

Descriptors: *United States, *Right-of-way, *Easements, *Dams, Diversion, Lakes, Legal aspects, Judicial decisions, Federal government, Diversion structures, Diversion dams, Structures, Ditches, Irrigation ditches, Irrigation, Governments, Water levels, Elevation, Height.

Defendant obtained from plaintiff United States a right-of-way entitling defendant to construct and maintain a ditch and to dam a public lake for purposes of irrigation. Plaintiff sought a decree of forfeiture, contending that defendant had not within the required period constructed facilities capable of raising the water level of the lake to the height specified in defendant's application for the right-of-way. Defendant contended that, although it had not raised the water level the specified 16 feet, it had constructed a ditch system and a small dam, all of which should be considered in evaluating the extent of defendant's performance. The Eighth Circuit Court of Appeals reversed a judgment for defendant. The Act of 1891, under which rights-of-way in public lands were granted for purposes of irrigation, provided for forfeiture of any section of a right-of-way where substantial construction had not occurred within 5 years of the grant. The proposed reservoir was a section separate from the ditch in the instant case. Sufficient reservoir construction was not accomplished. Defendant's exclusive right-of-way continued only as to the ditch and diversion facilities. (Dye-Florida)
W71-05911

75 YEARS OF IMPROVEMENT IN WATER SUPPLY QUALITY,
American Water Works Association, New York.
Abel Wolman.
In: Water, Health and Society, Bloomington, Indiana University Press, p 93-103, 1969.

Descriptors: *Water supply, *Water quality, *Water treatment, Filtration, Chlorination, Coagulation, Watersheds, Sewerage algae, Potable water.
Identifiers: *American Water Works Association, Chemical industry, Odor, Taste, Consumer.

This article discusses the various efforts of the Americal Water Works Association, in both technological and scientific fields, to provide water of maximum usefulness and satisfaction to the consumer over the last 75 years. Advances in water supply such as effective coagulation, sedimentation, filtration, disinfection and the use of chlorination are surveyed as milestones in water supply quality. Specific water quality analysis difficulties are assessed from the points of view of both the water diagnostician and the consumer. Particular attention is given to the identification of sources and causes of taste and odor, and the relationship of these to algae and to the burgeoning chemical industry. The use of such remedies as powdered activated carbon, ozone, chlorination, and chlorine dioxide is discussed. Advances in the water supply quality are attributed to the development of standard methods of analysis and to the judicious use of commercial equipment. A rapid trend is hypothesized toward the literal tailoring of water for the domestic, industrial, or farming consumer as requirements of water supply quality become more numerous and complex. (Murphy-Rutgers)
W71-05943

THE 'PROBLEM SHED' AS A UNIT FOR ENVIRONMENTAL CONTROL,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 06B.
W71-05945

BONE V MAY (RIPARIAN RIGHT TO ACCRETIONS WHERE FORMER RIPARIANS' LAND HAS ERODED).

225 NW 367-369 (Iowa 1929).

Descriptors: *Iowa, *Accretion (Legal aspects), *Riparian land, *Boundaries (Property), Avulsion, Riparian rights, Riparian waters, Boundary disputes, Navigable rivers, Missouri River, Navigable waters, Bank erosion, Erosion, Channel erosion, Land tenure, Real property, Prescriptive rights, Legal aspects, Judicial decisions.

Plaintiff landowner sued defendant landowners to quiet title to the land between plaintiff's land and the east bank of the Missouri River. Plaintiff contended that at one time, the east bank had gradually eroded all the disputed land, leaving plaintiff as the riparian owner and entitling him to all the land since formed by accretion. Defendants asserted various decrees and sources of title, including adverse possession, and contended that portions of the river bed had changed by avulsion rather than by accretion. Affirming a judgment for plaintiff, the Supreme Court of Iowa noted that in the face of conflicting evidence, the presumption is in favor of accretion as against avulsion. The court held that plaintiff's one time riparian status entitled him to all later accretions even where such accretions covered property of former riparian owners. (Liptak-Florida)
W71-05952

ASD SECURITIES V J H BELLOWS CO (RIGHT-OF-WAY OF NECESSITY WHEN ACCESS BY WATER BECOMES IMPOSSIBLE).
48 Ohio App 101, 192 NE 472-473 (1933).

Descriptors: *Ohio, *Easements, *Right-of-way, *Navigable waters, Land, Land tenure, Judicial decisions, Legal aspects, Navigation, Real property, Ponds.

Plaintiff sought to enjoin defendants from interfering with a right-of-way of necessity which plaintiff claimed across defendants' land. Plaintiff had succeeded to a right-of-way across a pond to lands which plaintiff's predecessor had purchased from defendants. The pond dried up occasionally and became at such times impossible to cross. Because of this, plaintiff claimed a right-of-way of necessity across defendants' land. The Court of Appeals of Ohio ruled for plaintiff. There are many holdings that a way of necessity will not be held to exist where there is already access to property over a navigable body of water. However, such a rule is inapplicable where water becomes too shallow for navigation and becomes impassable due to sogginess. (Duss-Florida)
W71-05958

O'HEARN V TOWN OF ADAMS (DAMAGES FOR OVERFLOW OF SEWAGE).
288 Mass 185, 192 NE 524-527 (1934).

Descriptors: *Massachusetts, *Damages, *Overflow, *Sewage, Sewers, Streams, Channels, Land, Land tenure, Diversion, Maintenance, Cities, Legislation, Rivers, Eminent domain, Legal aspects, Judicial decisions.

Plaintiff landowners brought a tort action against defendant town for damages to land and property resulting from the overflow of a river and discharge of sewage from an alleged common sewer. Plaintiffs alleged that the damage complained of resulted from acts of the superintendent of sewers commencing sixteen years before filing of action. The superintendent had diverted stream water into a channel near plaintiffs' land and extended the sewer line to this channel. The Supreme Judicial Court of Massachusetts gave judgment for defendant. Private actions will lie against a municipality where it is negligent in maintaining a common sewer, control of which is authorized by statute. However plaintiff must show that the town was obligated to do the work resulting in injury or that it was an exercise of corporate power. Here the proximate cause of injury was not the building and maintenance of the sewer but diversion of the stream. Further, plaintiff must show acceptance by the town of the statute relating to laying out of sewers. In the instant case defendant had not accepted the statute. Liability could not be predicated on eminent domain as there was no taking of plaintiffs' land. (Duss-Florida)
W71-05967

INSTITUTIONAL FACTORS INFLUENCING WATER DEVELOPMENT IN TEXAS,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 06B.
W71-05972

PUBLIC WATER FOR RURAL AREAS AND SMALL TOWNS,
Missouri Univ., Columbia. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 06D.
W71-05973

GIVENS V CHANDLER (INJUNCTION TO PROHIBIT INTERFERENCE WITH WATER SUPPLY).

143 So 79-81 (La App 1932).

Descriptors: *Louisiana, *Wells, *Pipelines, *Water rights, Water sources, Artesian wells, Judicial decisions, Legal aspects, Pipes, Water conveyance, Water sources, Relative rights, Real property, Damages, Water supply, Water utilization, Easements, Natural use, Adjudication procedure, Reservation doctrine, Water contracts.

Plaintiffs sought damages and an injunction to prohibit defendant from interfering with plaintiffs' right to lay a pipe for the withdrawal of water from a well on defendant's property. Plaintiffs sold to defendant a lot adjacent to their own with a reservation in the deed retaining an undivided one-half interest in an artesian well thereon and the right to secure water therefrom. Plaintiffs laid a pipe from their lot to draw water from the well. Defendants acquiesced in such action and urged no objection to the pipe's use for over a year. Subsequently, defendant tore out the pipe and refused to allow plaintiff to reconnect it to the well. Plaintiff brought suit, and defendant alleged that the character of the servitude was not such as to allow the utilization of a pipe to withdraw the water from the well. The trial court held for plaintiffs, granting the injunction prohibiting defendant from interfering with plaintiffs' replacing the necessary pipe, but denying plaintiffs damages. The Court of Appeals of Louisiana affirmed issuance of the injunction and awarded plaintiffs damages. Where a defendant willfully breaches a contract such as the one in this case all damages arising from the breach are recoverable. (Barnett-Florida)
W71-05976

APPALACHIAN ELECTRIC POWER CO V SMITH (CONSTITUTIONALITY OF HYDROELECTRIC PROJECT LICENSING).
67 F2d 451-458 (4th Cir 1933).

Descriptors: *Dams, *Navigable rivers, *Nonnavigable waters, *Federal Power Act, Hydroelectric plants, Hydroelectric project licensing, Administrative agencies, Federal project policy, United States, Land tenure, Riparian land, Real property, Adjudication procedure, Judicial decisions, Legal aspects, Administrative decisions, Permits, Federal government.
Identifiers: *Constitutionality.

Plaintiff electric company sued defendant members of the Federal Power Commission individually to remove a cloud on title to riparian land. Plaintiff contemplated erecting a dam on a non-navigable tributary of a navigable river and filed a declaration of intent with defendant as a prerequisite for obtaining a permit. Defendant issued plaintiff a standard form license, which plaintiff refused; plaintiff then requested defendant to either disclaim jurisdiction over the project or issue a minor form license under provisions of the Federal Water

Power Act, which would only contain conditions prohibiting interference with the navigability of the main river. Defendant refused, whereupon plaintiff filed suit, alleging that defendant's acts were unauthorized and unconstitutional. Defendant moved to dismiss for lack of jurisdiction. The lower court denied defendant's motion, but dismissed the complaint on the merits. Since defendants as individuals had threatened no action to prevent dam construction, the United States Court of Appeals reversed, holding that the federal courts had no jurisdiction to enjoin defendant's actions. Furthermore, since the United States was not joined, the court held that it was without jurisdiction to set aside the alleged title cloud. (Hart-Florida)
W71-05977

UNION SAND AND GRAVEL CO V NORTHCOTT (TITLE TO LAND BETWEEN HIGH AND LOW WATER MARKS).

135 SE 589-593 (Sup Ct App W Va 1926).

Descriptors: *West Virginia, *Low water mark, *Ownership of beds, *Boundary disputes, Boundaries (Property), River beds, Bands, Navigable rivers, Rivers, Navigable waters, Land, Real property, Legal aspects, Judicial decisions, Public rights, Riparian rights, Riparian land, Navigation, High water mark, Legislation, Beds under water, Streambeds, Gravels, Sands, Islands.

Plaintiff sought to recover the value of sand and gravel removed by defendant gravel company from island property above the low water mark. Plaintiff claimed title to the low water mark. Defendant contended that: (1) plaintiff's title was only to the high water mark; (2) if to the low water mark, plaintiff's title was only to the ordinary low water mark; and (3) plaintiff's title, if to the low water mark, should be to that level as modified by existing locks and dams. The Supreme Court of Appeals of West Virginia affirmed judgment for plaintiff. The owner of land bounded by a navigable river holds title to the low water mark, subject only to the public right of navigation. In determining boundaries, the low water mark is the farthest ebb of the tide, not the ordinary low water mark. The low water mark is to be determined with respect to the river in its natural condition and is not altered for legal purposes by public construction of dams or locks. (Dye-Florida)
W71-05979

HOME REAL ESTATE LOAN AND INS CO V PARMELE (STATE MAY PASS TITLE TO NON-NAVIGABLE TIDAL WATERS).
214 NC 63, 197 SE 714-719 (1938).

Descriptors: *North Carolina, *Tidal waters, *Coastal marshes, *Reservation doctrine, Land reclamation, Legal aspects, Judicial decisions, Remedies, Federal government, State governments, Navigable waters, High water mark, Low water mark, Ownership of beds, Swamps, Dredging, Channel improvement, Tides, Tidal effects, Land tenure.
Identifiers: *Intracoastal waterway.

Plaintiff corporation asked for a court determination of whether it could transfer to defendant title to 2,000 acres of tidal marshland that plaintiff had purchased from the state board of education. Defendant had signed a purchase contract but refused to accept delivery, asserting that reclamation of some of the land had revested title in the state. The Supreme Court of North Carolina affirmed a decision for plaintiff. The state has title to all beds under navigable water and may not convey the land for such purposes which would impede navigation. However, the American rule is that navigable waters are those that are in fact navigable, not merely tidal. The state thus could sell such lands constitutionally, and a statute allowed sale to plaintiff's predecessor in title. Plaintiff had fee simple title. Were the lands navigable, the state could merely have granted an easement for limited purposes to underwater land. When the title granted was fee simple, however, reclamation did not revest title in the state. (Hart-Florida)
W71-05980

EDWARDS V ATCHISON, T AND S F RR (PRESCRIPTIVE RIGHT TO DISCHARGE WATER).

15 F2d 37-38 (9th Cir 1926).

Descriptors: *California, *Discharge (Water), *Culverts, *Prescriptive rights, Surface waters, Railroads, Legal aspects, Judicial decisions, Precipitation excess, Conduits, Land, Damages, Surface drainage, Rain, Rainfall, Erosion, Real property, Rain water, Surface runoff, Riddance (Legal aspects).

Defendant railroad held a right-of-way adjacent to plaintiff's land. The right-of-way was elevated and allowed the passage of water through it only at the location of a culvert discharging onto plaintiff's property. Heavy rains resulted in damage to plaintiff's land when water was discharged in large quantities from the culvert. Plaintiff sought damages. Defendant contended that a prescriptive right to discharge water onto plaintiff's land has been established. After judgment for defendant, plaintiff appealed, contending only that no prescriptive right had arisen since no prescriptive period begins to run until the servient tenement has been injured. The Court of Appeals for the Ninth Circuit affirmed the judgment for defendant. Evidence showed that water had been discharged onto plaintiff's property for a sufficient period. Each such discharge resulted in a cause of action, regardless of injury. The prescriptive right began to run after the first discharge. Further, the holder of a railroad right-of-way must have notice of the discharge of water and have been requested to remedy it before an action may be brought for injury. Interruption of use by dry seasons did not interrupt the continuity of the adverse use. (Dye-Florida)
W71-05994

KELLY V CITY OF CAPE GIRARDEAU (LIABILITY OF CITY FOR FAILURE TO PROVIDE ADEQUATE STORM SEWERS).
72 SW2d 880-884 (Ct App Mo 1934).

Descriptors: *Missouri, *Storm drains, *Damages, *Remedies, Cities, Floodwater, Drainage systems, Sewers, Overflow, Surface runoff, Flood damage, Surface drainage, Real property, Land tenure, Local governments, Flood protection, Legal aspects, Judicial decisions.
Identifiers: Injunction (Mandatory).

Plaintiff landowner sought compensatory and punitive damages for flooding of his land resulting from defendant city's inadequate storm sewers. Defendant, over a period of several years, had failed to comply with an injunction requiring it to replace the inadequate sewers. Plaintiff contended he was entitled to compensation for each incident of flooding not previously the subject of judgment. Defendant contended plaintiff's recovery of damages in a prior suit barred all claims arising prior to that action. The court held that when flooding results from an abatable nuisance, the wrong is re-created on each occasion of flooding. The injured property owner has the right to bring an action on each incident of flooding, notwithstanding prior judgment on other such incidents. Noting that the defendant's failure to comply with the prior injunction entitled the plaintiff to punitive as well as compensatory damages, the court affirmed the lower court's award of damages. (Earl-Florida)
W71-05997

TOLCHESTER BEACH IMPROVEMENT CO OF KENT COUNTY V BOYD (ABILITY OF PUBLIC TO ACQUIRE PRESCRIPTIVE ACCESS TO WATER).

156 A 795-798 (Md App 1931).

Descriptors: *Maryland, *Contracts, *Prescriptive rights, *Riparian land, Claims (Contracts), Riparian rights, Legal aspects, Judicial decisions, Easements, Land, Land tenure, Roads, Public rights.

Plaintiff riparian landowner brought action for specific performance of a contract for sale of riparian land to defendant yacht club. Defendant refused to consummate the sale because: (1) a state road encroached upon the property, so that it was insufficient for appellee's needs; and (2) county commissioners had protested appellee's permit to erect docks because local fishermen had used the area for launching boats. After observing that the public could not by long-continued use have acquired a prescriptive right-of-way across the land, the Court of Appeals of Maryland granted plaintiff's prayer for specific relief. The road was acquired by condemnation and the county acquired an easement only. The riparian rights of the owner were unimpaired. (Hart-Florida)
W71-05998

STATE V MOUNTS (BOUNDARIES ON NON-NAVIGABLE STREAMS WHERE SURVEY DIFFERS FROM NATURAL MONUMENTS).
150 SE 513-515 (Sup Ct W Va 1929).

Descriptors: *West Virginia, *Boundaries (Property), *Non-navigable waters, *Boundary disputes, Real property, Land, Streams, Legal aspects, Judicial decisions, Shores, Banks, Adjudication procedure, Surveys, Meanders, Mapping, Land tenure, Taxes, Governments, State governments.

Defendant received land, bounded by a non-navigable stream, in the partitioning of property among heirs. The partitioning court had used courses and distances to describe the tract. However, the courses and distances arrived at did not coincide with the meanders of the stream. Plaintiff state claimed title by forfeiture to the strip of land lying between the tract's boundary as partitioned and the water, contending that no taxes had been paid on the strip since the partitioning. The Supreme Court of Appeals of West Virginia reversed a judgment for plaintiff. Title to land bounded by a non-navigable stream extends to the thread of the stream. The entire original lot was bounded by the stream, and it was the duty of the partitioning court to include all of the original property in the new lots. It must be assumed that the court did so. Those new lots in which the boundary did not coincide with the stream should have been presumed to extend thereto. Natural monuments prevail over a surveyor's calls. (Dye-Florida)
W71-06007

THE CONSERVANCY DISTRICT LAW (OUTLINE AND TEXT OF OHIO CONSERVANCY DISTRICT LAW).
Ohio Dept. of Natural Resources, Columbus. Div. of Water.

N.D. 65 P, 9 PHOTO, 1 CHART.

Descriptors: *Ohio, *Administrative agencies, *Drainage districts, *Water resources development, State governments, Water conservation, Water resources, Water policy, Water management (Applied), Water supply, Area redevelopment, Multiple-purpose projects, River basin development, Local governments, Water law, Legislation, Eminent domain, Condemnation, Rivers, Streams, Lakes, Floods, Flood control.

Although originally flood control agencies, the Ohio conservancy districts are now empowered to conserve and develop water supply, improve drainage, collect and dispose of wastes, provide for irrigation, and arrest erosion of the Lake Erie shore. This booklet discusses the organization of a conservancy district, the steps in development of a district, questions and answers concerning conservancy districts, and the text of the Ohio conservancy district law. The law itself is set forth in eight parts: (1) definitions; (2) organization of a district; (3) powers, duties, and organization o

servancy district boards of directors; (4) appsal of benefits; (5) financial administration; (6) rcorporate relations and conflict in jurisdiction; police powers and regulations; and (8) conction and interpretation of the law. In addition reviously mentioned powers, the district may: alter the course of rivers and streams; (2) fill abandoned or altered watercourse; (3) conct and operate dams; (4) plant forests on dist land; and (5) acquire by purchase or power of inent domain easements or lands to effect the poses of the act. (Hart-Florida)
1-06046

ATER POLLUTION: OBSERVATIONS ON NNECTICUT'S RESPONSE,
primary bibliographic entry see Field 05G.
1-06047

IE ENVIRONMENTAL LAWSUIT: TRADIONAL DOCTRINES AND EVOLVING THEOES TO CONTROL POLLUTION,
r primary bibliographic entry see Field 05G.
1-06048

AVIGATION AND NAVIGABLE WATERS,
deral Register, Vol 35, No 103, p 8279-8280, ay 1970. 2 p.

escriptors: *Administrative agencies, *Federal vernment, *Navigation, *Regulation, Boating gulations, River regulation, Governments, Legal pects, Transportation, Harbors, Bridges.
entifiers: *Harbor lines, *Anchorages.

mendments to Department of Transportation gulations provide that the Secretary of Transportion has delegated authority to the Commandant the Coast Guard to issue regulations regarding e functions, powers, and duties of the Coast uard. The Commandant redelegates these duties the Chief of the Coast Guard Office of Operaons with a proviso that regulations pertaining to: establishment of anchorages, (2) changes in chorage regulations, and (3) affirmance of acons of District Commanders concerning security nes shall not be redelegated. Furthermore, drawidge operation regulations for the Sabine River, Texas, are promulgated along with the revocan of operating regulations for a removed bridge Petaluma, California. In addition, the administative procedure for the establishment of harbor nes is published herein by the Department of the rmy Corps of Engineers. (Hart-Florida)
1-06049

YSTERS AND CLAMS (STATUTES GOVERNG TAKING OF OYSTERS AND CLAMS).

d Code Ann art 66c, secs 700 thru 701, 707, 713 upp 1970).

escriptors: *Maryland, *Oysters, *Clams, *Adinistrative agencies, Legislation, Shellfish, State vernments, Aquatic animals, Commercial shellfh, Commercial fishing, Regulations, Fishing, gal aspects, Invertebrates, Dredging.

is amendment to Maryland law concerning tak of oysters and clams prescribes tonging seasons d dredging restrictions. In addition, the Departent of Chesapeake Bay Affairs is authorized to mporarily close any natural oyster bed in selected unties without public hearing. The Department is rthermore directed to adopt regulations to insure at the hydraulic clam dredge license of privileges e not abused. Areas in which it is prohibited to e oysters or clams with other than hand tools are escribed. Also, restricted areas in specified couns are prescribed. The amendment additionally escribes: (1) powers, duties, and provisions for ensing of dealers and shippers by the Departnt; (2) authorization for suspension and revocan of licenses; (3) a severance tax levy; (4) penalfor violations of the law; (5) county advisory committees; and (6) authorization for seizure and disposition of clams caught, sold, or held in violation of the law. (Hart-Florida)
W71-06050

CONTROL OF RELEASES OF RADIOACTIVITY TO THE ENVIRONMENT.
Atomic Energy Commission, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-06051

VIEWS OF THE GOVERNORS ON TAX INCENTIVES AND EFFLUENT CHARGES (WATER POLLUTION CONTROL AND ABATEMENT).
For primary bibliographic entry see Field 05G.
W71-06052

WATER POLLUTION PROBLEMS AND CONTROL PROGRAMS IN MICHIGAN'S PORTION OF THE GREAT LAKES.
Michigan Water Resources Commission, Lansing.
For primary bibliographic entry see Field 05G.
W71-06053

WATER QUALITY STANDARDS.
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-06054

THE ENFORCEMENT PHASE OF POLLUTION ABATEMENT: THE ROLE OF THE ARMY ENGINEERS,
For primary bibliographic entry see Field 05G.
W71-06055

BLACK V TOWN OF BESSEMER CITY (DAMAGE TO LAND BY SEWAGE PLANT).

197 NC 195, 148 SE 29 (1929).

Descriptors: *North Carolina, *Cities, *Water pollution, *Sewage disposal, Eminent domain, Damages, Land, Real property, Remedies, Water pollution sources, Water pollution effects, Legal aspects, Judicial decisions, Legislation, Local governments, Sewage, Wastes, Diversion, Air pollution, Waste treatment, Waste disposal.

Plaintiff sought damages for injury to his property resulting from the erection of defendant town's sewage disposal plant. Plaintiff contended that he was damaged by the diversion of sewage water into a stream running through his land and by pollution of the stream and the atmosphere. The trial court ruled for defendant and plaintiff appealed, contending that he was entitled to at least nominal damages for injury done his land by pollution of the stream. The Supreme Court of North Carolina affirmed. Plaintiff's contention would have been correct but for a statute giving cities the right to establish sewer systems, implemented by the power of eminent domain. Thus plaintiff was not entitled to damages as a matter of law. (Dye-Florida)
W71-06086

DASHNER V WOODS BROS CONST CO (IMPLEMENTATION OF RIVER PROTECTION PROJECT).
217 NW 464-468 (Iowa 1928).

Descriptors: *Iowa, *Administrative agencies, *Erosion, *River training, Levees, Flood control, Drainage systems, Construction, Plans, Surveys, Contracts, Legislation, Benefits, Assessments, Land tenure, Rivers, Missouri River, Banks, Shores, Dams, Shore protection, Topography, Remedies, Legal aspects, Judicial decisions

Plaintiff landowners sought to prevent payment to defendant construction company for improvements along the Missouri River and to prevent assessment of landowners in a drainage district to pay for improvements. Pursuant to the Iowa drainage law, plaintiffs, among others, had petitioned for creation of a river protection district and for construction of improvements to prevent erosion of the banks of the Missouri River. Plaintiffs alleged that the board of supervisors exceeded its authority in carrying out the improvements and that there was not adequate compliance with the contract, plans, and specifications. The trial court dismissed plaintiffs' petition and the Supreme Court of Iowa affirmed. Evidence showed that the board carried out the improvements in a proper manner. The river banks were constantly changing due to erosive and cutting action of the water. It was proper for the board to appoint engineers with power to submit plans and determine the nature and location of necessary improvements. The board and all interested parties inspected the work as it progressed, and no objection was raised until after the project was finished. The board accepted the improvements, and, in the absence of fraud, plaintiffs could not now cancel payment for the work. (Duss-Florida)
W71-06087

HOWES V TOWN OF BARNSTABLE (OWNERSHIP OF CLAM BEDS).
285 Mass 361, 189 NE 34-37 (1934).

Descriptors: *Ownership of beds, *Massachusetts, *Clams, *Public rights, Land tenure, Shellfish, Land, Shores, High water mark, Permits, Damages, Legislation, Cities, Commercial shellfish, Legal aspects, Judicial decisions, Channels, Marshes.

Plaintiff sought to enjoin defendant town and others from interfering with his clam fishery located on a sand flat. Plaintiff further sought damages for the taking of clams and injury to the fishery. Plaintiff had acquired exclusive right to dig clams on the flat for a term of years. This right expired and was not renewed by the town. Plaintiff continued to dig clams without a permit and sought to acquire title to the area by acquiring two quitclaim deeds. Plaintiff also claimed that he acquired an adverse title as against all but the true owners by putting nets and signs around the flat signifying his ownership. The master dismissed plaintiff's bill and the Supreme Judicial Court of Massachusetts affirmed. Plaintiff failed to sustain the burden of proving his title to the premises. The evidence did not show that plaintiff's grantors possessed any interest in the property. The spreading of nets and erection of signs without inclosure, permit, or legislative sanction was ineffective to destroy the public right to take shellfish from the disputed area. Plaintiff's efforts at propagation and cultivation during the life of his license did not give him any rights in the fishery against the town after expiration of his permit. (Duss-Florida—)
W71-06089

STATE V MIDDLETOWN HYDRAULIC CO (VALIDITY OF WATER RIGHTS RESERVATION IN GRANT OF CANAL PROPERTY TO STATE).
114 Ohio St 437, 151 NE 653-665 (1926).

Descriptors: *Ohio, *Water rights, *Canals, *Milldams, Dams, Riparian rights, Riparian waters, Riparian land, Sluices, Flumes, Diversion, Diversion structures, Contracts, Water contracts, Land tenure, State governments, Public land, Public rights, Water utilization, Preferences (Water rights), Legal aspects, Judicial decisions.

Plaintiff state brought a quo warranto action to challenge defendant corporation's right to divert and use water from a state-owned canal. Defendant contended that his predecessor's grant of the canal property to the state reserved the water rights for the operation of a mill and that both the state and defendant's predecessors had recognized and preserved this reservation of water rights for 100 years. Plaintiff argued that: (1) the canal commission had no authority to acquire less than a free simple and must have fee simple, having been in

possession for 100 years, and (2) the original water rights were not a reservation from the title but a grant by the state, personal to defendant's predecessor and expiring upon his death. Affirming a judgment for defendant, the Supreme Court of Ohio held that plaintiff's possession was in recognition, not exclusion, of defendant's water rights for 100 years and is conclusive of the state's interpretation of its power to hold less than a fee simple. The court also noted that the reservation for a specific purpose only limited the quantity of defendant's water rights and not the use to which he might apply the water. (Liptak-Florida)
W71-06098

COUNTY OF BECKER V SHEVLIN LAND CO (RIGHT TO CONNECT NAVIGABLE STREAMS WITH HIGHWAYS).

243 NW 433-434 (Minn 1932).

Descriptors: *Minnesota, *Navigable rivers, *Highways, *Access routes, Administrative agencies, Streams, Navigable waters, Lakes, Benefits, Costs, Right-of-way, Beds, Ownership of beds, Public rights, Legal aspects, Judicial decisions, Land tenure, Legislation.
Identifiers: *Constitutionality.

Plaintiff land company sought to prevent defendant county from constructing a connecting road between a stream and a public highway. Plaintiff contended that a state act authorizing construction of connecting roads with navigable streams was special legislation and thus unconstitutional. Plaintiff also contended that a patent from the United States, describing the river bed as among plaintiff's lands, conveyed title to the bed. Therefore, the state had no interest in it. The district court issued an order appointing commissioners to appraise benefits and damages consequent upon the taking of the right-of-way for the highway. The Supreme Court of Minnesota affirmed. The state act authorizing connecting roads with navigable streams was not unconstitutional. There was no impropriety in authorizing a highway which would provide access to navigable streams. Title to beds of navigable streams is in the state unless conveyed by the United States prior to the state's admission to the Union. Such a conveyance never occurred, and the government patent describing the river bed would not be construed as conveying title. Since the stream in question was navigable, and therefore public waters, the connecting road could be sustained as for a public purpose. (Duss-Florida)
W71-06099

SNOW AND RESERVOIR MANAGEMENT IN CANADA FOR THE COLUMBIA RIVER TREATY OPERATION,
British Columbia Hydro and Power Authority, Vancouver, Canada, Hydrology Branch.
For primary bibliographic entry see Field 02C.
W71-06134

QUINLAN V BOROUGH OF FAIR HAVEN (TITLE DISPUTE TO RIPARIAN LAND AND SUBMERGED LAND UNDER DOCK).

131 A 870-871 (NJ Ct Err and App 1926).

Descriptors: *New Jersey, *Docks, *Riparian land, *Ownership of beds, Piers, Riparian rights, Riparian waters, Roads, Public rights, Navigable waters, Shores, Banks, Prescriptive rights, Land tenure, Real property, State governments, Legal aspects, Local governments, Piles (Foundations), Jucidial decisions, Bulkheads.

Plaintiff riparian owner sued to eject defendant town from a road leading to a wharf and from submerged land over which the wharf was built. Plaintiff traced her title to the road through various deeds and her title to the submerged land to a riparian grant from the state. Defendant claimed title through: (1) a deed conveying all the right and title of a dock company which had used the land, and (2) adverse possession. Affirming a judgment for plaintiff, the Court of Errors and Appeals of New Jersey noted that the dock company's charter of incorporation gave it no title to land which it did not already own. Thus the company had no title to convey to defendant. The court also noted that defendant's possession of the submerged land was not adverse since: (1) the dock company's charter constituted an express license to use the land; and (2) title by prescription cannot be secured against the public, which held the property before its conveyance to plaintiff. (Liptak-Florida)
W71-06145

MILLER V COMMONWEALTH (TITLE TO VIRGINIA TIDAL MARSHES).
166 SE 557-567 (Sup Ct App Va 1932).

Descriptors: *Virginia, *Ownership of beds, *Tidal marshes, *Boundary disputes, Boundaries (Property), Legislation, Recreation, Legal aspects, Judicial decisions, Land, Real property, Marshes, Rivers, Banks, Riverbeds, Tidal waters, High water mark, Low water mark, Hunting, Riparian land, Land tenure, Beds, Beds under water, Streambeds.

In a criminal prosecution for unlawfully hunting on the lands of another without the owner's consent, defendant hunter was convicted. The land on which defendant had hunted lay between the high and low water marks on the banks of the James River. Defendant contended that the owner of the upland did not own the property on which he hunted. The Supreme Court of Virginia affirmed his conviction. Without specific language to the contrary, a Crown grant of uplands did not include the adjacent tidal marshes. However, an act of the legislature in 1819 granted the land between the high and low water marks to the holder of the adjacent uplands, where such land had not been used as a common by the public. A proviso in an act of 1792 reserving beds of rivers to the states applied only to conveyances made after 1792. The land in question was granted prior to 1760 and was never used by the public in common. (Dye-Florida)
W71-06161

OLIVER V CITY OF RICHMOND (COMPENSATION FOR STATE DIVERSION OF A NAVIGABLE STREAM).
178 SE 48-53 (Sup Ct App Va 1935).

Descriptors: *Virginia, *Diversion, *Eminent domain, *Navigation, Navigable rivers, Legal aspects, Judicial decisions, Condemnation, Damages, Land, Real property, Riparian rights, Navigable waters, Compensation, Riparian land, Rivers, Running waters, Ownership of beds, Governments, State governments, Federal government, Riparian waters, Alteration of flow, Public rights.

To improve navigation defendant city sought to divert the waters of a navigable river into an artificial channel. Plaintiffs claimed a property right in the river's current and sought compensation for the decrease in value of their property resulting from defendant's diversion. Plaintiffs contended that only Congress was empowered to improve navigation without compensating landowners for depriving them of access to the flow. The Supreme Court of Appeals of Virginia reversed a judgment for plaintiffs. Beds of navigable rivers belong to the state. Riparian owners' right to a normal flow of water in a river's natural course is subject to the government's power to improve navigation. Where the government exercises its right to improve navigation, only those landowners whose properties are taken must be compensated, not those who are being deprived of an incidental and subservient right. Deprivation of such rights is not a taking requiring compensation, whether accomplished by the federal government or a state. (Dye-Florida)
W71-06162

GEORGE F FISH FARMS V STATE (STATE'S LIABILITY FOR FLOODING FARM).
135 Misc 188, 237 NYS 383-390 (Ct Cl 1929).

Descriptors: *New York, *Flooding, *New York State Barge Canal, *State governments, Canals, Condemnation, Eminent domain, Compensation, Payment, Crops, Water injury, Flood damage, Damages, Riparian land, Ditches, Drainage, Legal aspects, Judicial decisions, Farms, Dams, Rainfall, Lakes, Littoral, Agriculture, Muck soils.

Plaintiff lessee sued defendant state for damages caused by flooding. Plaintiff leased muckland near a lake, prepared it, and planted vegetables. The tract was drained by a ditch to the lake. The lake rose into the ditch, flooding the land and destroying plaintiff's crops, although flooding had not occurred before. The lake was part of a barge canal, and defendant had constructed a dam downriver from the lake, raising its level about 2 1/2 feet. Various riparian owners were then compensated for flooding, after two test decisions. Plaintiff contended that these decisions required that defendant be held liable, but defendant asserted that since plaintiff's tract was not on the lake and the flood was caused by rainfall, it was not liable. After noting that the proper measure of damages was rental value, plus preparation and planting costs, the Court of Claims of New York stated that it was immaterial that plaintiff's tract was not littoral. Determining the evidence sufficient to establish that the dam caused plaintiff's injury, the court held that the prior decisions were binding and adjudged defendant liable. (Hart-Florida)
W71-06163

COLONNA V STATE (DAMAGES FOR FLOODING OF QUARRY).
146 Misc 762, 262 NYS 846-847 (Ct Cl NY 1933).

Descriptors: *New York, *Damages, *Canal seepage, *Quarries, Leakage, Seepage, New York State Barge Canal, Legal aspects, Judicial decisions, Canals, Land, Real property, Pumping, Dewatering, Pumps, Drainage, Submergence.

Defendant state maintained a barge canal from which water seeped into plaintiff's quarry. Plaintiff sought as damages the value of stone which could have been removed from the quarry during each year of the seepage. The Court of Claims of New York affirmed a judgment for plaintiff in a reduced amount. Plaintiff could have operated the quarry during each of the years in question by pumping the water from the premises. He was entitled only to the cost of pumping sufficient water from the quarry to carry on his business, including depreciation of pumping equipment. If the quarry had actually been in operation over the period of the injury, plaintiff would have been entitled also to the loss of production between working the quarry under wet conditions and under dry conditions. (Dye-Florida)
W71-06164

CRAGE V CITY OF BUFFALO (DUTY OF CITY TO PROVIDE FOR SEWAGE DISPOSAL).
148 Misc 298, 265 NYS 640-643 (Sup Ct 1933).

Descriptors: *New York, *Cities, *Sewage disposal, *Canals, Easements, Sewers, Channels, Legal aspects, Judicial decisions, State governments, Local governments, Damages, Remedies, Wastes, Disposal, Open channels, Sewage, Waste disposal, New York State Barge Canal, Land, Landfills, Public health, Leases, Rent, Prescriptive rights.

Plaintiff owned property on a bank of the Erie Canal. While the canal was in existence, plaintiff passed sewage from his property into it. The state abandoned the canal and conveyed the canal property to defendant city. Defendant filled the canal, leaving a narrow channel of running water on each side of the fill. Plaintiff continued to pass sewage into one of these channels, but the current therein

was insufficient to carry solid wastes. Solid waste accumulated, creating a noxious odor which induced plaintiff's tenants to move. Plaintiff sued for his lost rentals, contending that: (1) his use of the canal to dump sewage had created in him a prescriptive right to do so; (2) defendant, on filling the canal, was obligated to provide alternate means for disposal of sewage from plaintiff's land; and (3) defendant's action in leaving channels open amounted to establishment to a sewage system, which, once created must be maintained in a proper manner. The complaint was dismissed. No prescriptive right arose. Defendant was not obligated to provide plaintiff with sewage facilities. Creation of the channel was incidental to filling the canal and not the creation of a sewer system. (Dye-Florida)
W71-06170

KIRK V MAUMEE VALLEY ELECTRIC CO (LEASE OF WATER RIGHTS IN CANAL SUBJECT TO STATE'S RIGHT TO ABANDON CANAL).
279 US 797, 49 Sup Ct 507-510 (1929).

Descriptors: *Canals, *Hydroelectric plants, *Water rights, *Water contracts, Surplus water, Contracts, Leases, Ohio navigation, Navigable waters, State governments, Legislation, Cities, Condemnation, Legal aspects.

Plaintiff hydroelectric power company sued to enjoin defendant state public works supervisor from draining a canal, thereby stopping the supply of surplus water to plaintiff's power plant. Plaintiff contended that draining the water was an impairment of the state's contract obligations under leases and grants of surplus water rights to plaintiff and amounted to taking plaintiff's property without due process. Reversing a decree for plaintiff, the Supreme Court of the United States noted that the statutes authorizing surplus water leases provided for cancellation only if hydroelectric production interfered with navigation or if the surplus water was needed to improve navigation. However, the court held that the statutes did not impose a duty on the state to maintain the canal, and the state could abandon the canal when no longer needed for navigation purposes without impairing plaintiff's rights, since those rights were only incidental to the public right of navigation. (Liptak-Florida)
W71-06171

STATE OF NEW JERSEY V STATE OF DELAWARE (LOCATION OF DELAWARE RIVER BOUNDARY BETWEEN NEW JERSEY AND DELAWARE).
291 US 361, 54 Sup Ct 407-416 (1934).

Descriptors: *New Jersey, *Delaware, *Boundary disputes, *Ownership of beds, Navigable waters, Navigable rivers, Delaware River, Bays, Estuaries, Channels, Thalweg, Beds, Legislation, Riparian rights, Prescriptive rights, Riparian land, Judicial decisions, Legal aspects, Beds under water, State governments, Rivers.

Plaintiff New Jersey sought determination of the boundary between Delaware and New Jersey in parts of the Delaware River and Bay. In one controversy title to the bed of the river within a twelve mile circle was at issue. Plaintiff claimed: (1) that defendant's chain of title was defective, and (2) title by prescription. The second controversy involved the boundary line between the states in the river below the circle and in the bay. Plaintiff claimed that the boundary between the states was the thalweg. Defendant claimed title to the geographical center. The Supreme Court of the United States found for defendant in the first controversy and for plaintiff in the second. First, defendant's title derived from a valid patent of the British Crown. A compact between New Jersey and Delaware concerning various rights in the Delaware River did not affect title in this area. Plaintiff never acquired title by prescription to the disputed area. Secondly, international law locates river boundaries between states at the middle of the channel as defined by the thalweg and not at the geographical center. The same doctrine applies to estuaries and bays where a dominant sailing channel can be found. (Duss-Florida)
W71-06172

COLGATE V PHILADELPHIA ELECTRIC POWER CO (CONSTITUTIONALITY OF CONDEMNATION OF PENNSYLVANIA LAND FOR OVERFLOW FROM MARYLAND DAM).
20 F2d 263-264 (ED Pa 1927).

Descriptors: *Pennsylvania, *Maryland, *Eminent domain, *Hydroelectric power, Electric power production, Electric power industry, Backwater, Damsites, Design flood, Hydroelectric plants, Water law, Remedies, Maximum probable flood, Real property, Condemnation, Compensation, Dams, Legal aspects, Judicial decisions.
Identifiers: *Constitutionality.

Plaintiff landowner sought to enjoin defendant power company from condemning his land. The land was in Pennsylvania, but was to be condemned for overflow by backwater from a Maryland dam for the benefit of a Maryland corporation. Plaintiff contended that a taking by defendant Pennsylvania corporation for the benefit of a Maryland corporation was not for a public purpose in Pennsylvania and was hence unconstitutional. It was determined that the Maryland damsite was the only one available, and that the Maryland company was formed for the sole purpose of satisfying Maryland law. The power generated was to be used to serve the Pennsylvania public. Hence the federal district court rejected plaintiff's assertion and dismissed the complaint. (Hart-Florida)
W71-06173

UNITED STATES V HAYES (TITLE TO STREAMBED FORMERLY PART OF INDIAN RESERVATION).

20 F2d 873-890 (8th Cir 1927).

Descriptors: *Ownership of beds, *Oil, *Boundary disputes, *Indian reservations, Boundaries (Property), Land tenure, Real property, Civil law, Riparian land, Non-navigable waters, Intermittent streams, Legal aspects, Judicial decisions, Beds under water.

Plaintiff United States brought action to determine title to streambeds in a non-navigable river. The river passed through what was formerly the Creek Indian reservation; oil had been discovered under the river bed. In the original treaty between plaintiff and the Creeks, the Creeks were recognized as a self-governing nation within the United States, and all the lands of the tribe were jointly owned by its members. This scheme proved unworkable, and the lands were alloted in fee among the members. Other portions were purchased outright. These various landowners claimed title to the thread of the stream, while plaintiff contended that the streambeds were reserved to the Creek nation in the allotment and purchase deeds. The Eighth Circuit Court of Appeals noted that under both common and civil law, without consideration of the intent of the parties, the conveyance would extend to the thread of the stream. However, determining that the parties' intent prevailed, the court undertook an extensive examination of the allotments and held that the parties had never intended to reserve the streambed to the non-existent Creek Nation. Accordingly, title of the various riparian owners was held to extend to the thread of the stream. (Hart-Florida)
W71-06177

HOGUE V STRICKER LAND AND TIMBER CO (NAVIGABLE RIVER AS BOUNDARY BETWEEN STATES).
2 F Supp 905-908 (SD Miss 1933).

Descriptors: *Mississippi, *Louisiana, *Boundary disputes, *Boundaries (Property), Accretion, Mississippi River, Islands, Navigable rivers, Channels, Judicial decisions, Legal aspects, Riparian rights, Riparian land, Alteration of flow, Adjudication procedure, Rivers, Erosion.

Plaintiff owned property fronting on the east side of the Mississippi River. The river shifted westward toward the Louisiana side, depositing accretions to plaintiff's mainland. An island on the Louisiana side of the river became connected to the Mississippi shore when the main channel of navigation in the river, forming the boundary between the states, changed from one side of the island to the other. Plaintiff brought an action to fix boundaries relative to the island and the accretions. Defendant Louisiana timber corporation claimed that the island was within the state of Louisiana. The federal district court held that while the navigable river forming the boundary between the states was gradually shifting, the boundary between the riparian parties as well as between the states shifted with the river. However, when the main channel of the river changed from one side of the island to the other the boundary between the states did not shift, but remained in the center of the old channel as it was when the water ceased to flow continuously therein. (Powell-Florida)
W71-06178

APPALACHIAN ELECTRIC POWER CO V SMITH (FEDERAL POWER COMMISSION'S POWER TO REGULATE PROJECTS ON NON-NAVIGABLE RIVERS).
4 F Supp 6-25 (WD Va 1933).

Descriptors: *Federal Power Act, Navigable waters, *Non-navigable waters, *Administrative agencies, Administrative decisions, Permits, Rivers and Harbors Act, Legislation, Navigable rivers, Flow, Federal project policy, Projects, Obstruction to flow, Dams, Reservoirs, Ownership of beds, Regulation, Federal government, Federal jurisdiction, Navigation, Legal aspects, Judicial decisions, Interstate.
Identifiers: Interstate commerce.

Plaintiff power company sought to enjoin defendant Federal Power Commission from acting unlawfully in approving plaintiff's proposed power project. Defendant, under the Federal Water Power Act, had offered to issue plaintiff a standard license under the Act after a finding that the project would affect interstate commerce. Plaintiff refused this license, claiming that the Commission was without jurisdiction over the project. Plaintiff offered to accept a less stringent license complying with the protection afforded navigation under the Rivers and Harbors Act. The project was to be build on a non-navigable river which fed into a navigable river. Defendants moved to dismiss plaintiff's bill and the federal district court granted the motion. Under the Act, Congress is without jurisdiction over non-navigable streams not in public lands or reservations of the United States where obstruction of such streams would not affect interests of interstate or foreign commerce. However, upon application for a project, it is for the Commission to determine whether interests of interstate or foreign commerce would be affected by such construction. Though courts are not bound by the Commission's findings, in this instance their finding that the proposed project would affect interstate or foreign commerce on a navigable river was supported by the evidence. (Duss-Florida)
W71-06183

WATER-USE LAW AND ADMINISTRATION IN WISCONSIN,
Wisconsin Univ., Madison. School of Law.
Harold H. Ellis, J. H. Beuscher, Cletus D. Howard, and J. Peter DeBraal.
Wisconsin Univ Extension, Madison, Department of Law, 1970. 720 p, 6 fig, 11 tab, 8 append.

Descriptors: *Water law, *Wisconsin, *Legal aspects, *State jurisdiction, *Federal jurisdiction, Judicial decisions, Jurisdiction, Ownership of beds, Reparian rights, Public rights, Administrative decisions, Regulation, Water users, Admiralty, Water rights, Eminent domain, Overlying proprietor, Preferences (Water rights), Water rights, Economics.
Identifiers: *Private water rights, State agencies, Constitutional aspects, Evaluating water laws.

This book is a concise summary of legal aspects pertinent to water use in Wisconsin. It emanated from some 20 years investigations conducted by the University of Wisconsin Law School, partially under a four year contract between the University and the Department of Agriculture. The 19 chapters of the volume incorporate the following subject matter relevant to one of the major resources of the state: division of water; private rights to use water courses, diffused water, and groundwater; protection of water rights; public rights to use navigable waters; the role of state agencies, particularly the Department of Natural Resources, in control of water level and pollution; the role of local government in the disposition of water; federal, interstate, and international rights in the use of water; evaluation of water laws. The appendixes provide illustrative legal decisions. The volume is a source book for all concerned with the use of water, including the riparian owners, irrigation farmers, industrialists, lawyers, administrators, and conservationists. Although the book deals primarily with Wisconsin, the experiences in this state may suggest solutions of water law problems in other areas. (Wilde-Wisconsin)
W71-06192

GEORGE W ARMBRUSTER, JR, INC V WILDWOOD (EFFECT OF BEACH EROSION AND ACCRETION UPTON TITLE TO RIPARIAN LAND).

41 F2d 823-831 (D NJ 1930).

Descriptors: *Accretion (Legal aspects), *Roads, *Riparian land, *Cities, Erosion, Beach erosion, Land tenure, Real property, Oceans, Atlantic Ocean, Legal aspects, Judicial decisions.

Plaintiff riparian owner sought to enjoin defendant municipality from maintaining a boardwalk on the bed of an avenue. Plaintiff contended that the boardwalk hindered his right of ingress and egress from his land on the ocean side of the avenue. In the course of its decision, the court noted the erosion and later accretion of plaintiff's land and the roadbed did not affect the dedication of the avenue or plaintiff's title. (Hart-Florida)
W71-06195

IMPLICATIONS OF WATER QUALITY LAWS FOR THE FEEDLOT INDUSTRY,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 05G.
W71-06222

WATER, WATER EVERYWHERE---BUT: A STUDY OF THE POLITICO-ADMINISTRATIVE ASPECTS OF WATER DEVELOPMENT IN MONTANA,
Montana State Univ., Bozeman. Water Resources Research Center.
Richard G. Sheridan.
Montana University, Joint Water Resources Research Center Report No 9, June, 1968. 286 p, 16 tab, 8 charts. WRR Project B-004-MONT (3).

Descriptors: *Montana, *Political aspects, *Legal aspects, *Water policy, *Administrative agencies, Prior appropriation, Leadership, Coordination, Economics, Management, Water allocation (Policy), Water rights, Beneficial use, Water law, State jurisdiction, Federal-state rights conflicts, State governments, Reasonable use.
Identifiers: *Administrative problems, Administrative aspects.

Montana is a water-abundant state, the water resources of which are extremely important to its economy. In this comprehensive report, all agencies and officials dealing with water resources administration and development are listed and discussed. The hierarchy of control over the state's water resources is outlined. The author believes that the present type of water resources management is duplicative, unwieldy, and inefficient. He outlines some of Montana's long-standing water problems and suggests new solutions. Water rights in Montana are basically modeled on prior appropriation, which can lead to waste and does not guarantee beneficial use. Irrigation, heavily subsidized by the federal government at a time when non-planting of crops is also subsidized, is wasteful of water. Recreational use should be the prime purpose of water resources in the west. The author then erects a model system of water resources administration for the state designed to be capable of handling efficiently the problems he has discussed. (Yensen-Arizona)
W71-06226

CONNECTICUT WATER LAW: JUDICIAL ALLOCATION OF WATER RESOURCES,
Connecticut Univ., Storrs. Inst. of Water Resources.
Robert I. Reis.
Report No 4, 1967. 215 p, 6 append. OWRR Project A-012-CONN (2).

Descriptors: *Connecticut, *Water law, *Water resources, *Riparian rights, Navigable waters, Non-navigable waters, Reasonable use, Dams, Ownership of beds, Diversion, Riparian land, Riparian waters, Water pollution, Water supply, Condemnation, Damages, Public health, Public rights, Legal aspects, Prescriptive rights, Navigation, Federal-state water rights conflicts, Recreation, Groundwater, Surface waters.

The first of four parts in this work discusses riparian rights in non-navigable waters; the discussion includes: (1) the nature of riparian rights, tracing the evolution of the reasonable use doctrine, including the prior occupation and natural flow theories; (2) specific reasonable use controversies, such as detention and dams, diversions, and non-municipal water pollution; (3) recreational use; (4) acquisition and protection of municipal water supplies; (5) municipal liability for sewerage, accelerated stream flow, and pollution; (6) extinction of the riparian right and loss of the 'right' to exercise existing riparian rights by estoppel, condemnation, and prescription; and (7) littoral rights on lakes and ponds. The doctrines of public and private rights in navigable waters are discussed in part two. Topics considered are: (1) the navigation doctrine, including a discussion of rules distinguishing navigable and non-navigable waters, (2) public rights in navigable waters; and (3) various riparian rights in navigable waters, including rights of access. Part three is devoted solely to groundwater, including both underground streams and percolating waters. Subjects included within the part four discussion of surface water are mills and ponds, sewerage assessments, and diffused surface water. (Hart-Florida)
W71-06273

DELAWARE RIVER BASIN COMM'N HEARING TO EXPAND THE COMPREHENSIVE PLAN.
Federal Register, Vol 35, No 96, p 7671, May 15, 1970. 1 p.

Descriptors: *Interstate compacts, *Interstate commissions, *Sewage treatment, *Flood control, Sewage, Administrative agencies, Administrative decisions, Cities, Sewage districts, Governments, Local governments, Flood protection, Federal government.

The Delaware River Basin Commission published notice of hearings to be held to expand the Comprehensive Plan to include the following projects: (1) a sewage collection and treatment system to serve Mount Pocono, Pennsylvania; (2) a flood protection project for Tamagua, Pennsylvania; and (3) a project to improve and enlarge the Kiamesha Lake Sewer District treatment plant in Thompson, New York. (Hart-Florida)
W71-06274

HEARING BY DELAWARE RIVER BASIN COMM'N TO EXPAND THE COMPREHENSIVE PLAN.
For primary bibliographic entry see Field 05G.
W71-06275

CERTIFICATES OF FINANCIAL RESPONSIBILITY (OIL POLLUTION).
Federal Register, Vol 35, No 250, p 19644 (Dec 25, 1970). 1 p.

Descriptors: *Administrative agencies, *Water pollution, *Administrative decisions, *Water pollution sources, Pollutants, Pollution abatement, Water pollution control, Federal government, Ships, Regulation, Water quality, Non-structural alternatives.
Identifiers: *Financial responsibility.

The Federal Maritime Commission published notice of an extension of time for owners or operators of certain barges to apply for a certificate of financial responsibility. The extension until February 15, 1971, was granted because a commission order provides that an applicant desiring a certificate of financial responsibility for potential damages of oil pollution under the Water Quality Improvement Act should apply no later than December 31, 1970. However, requests for special consideration will be granted if good cause is shown. Since certain barges which are not self-propelled and do not carry oil as cargo may be exempt from the Water Quality Improvement Act financial responsibility requirements by legislation pending in Congress, and since nonreturnable application fees are under consideration, the Commission considers good cause to exist ipso facto for non-oil-carrying, non-self-propelled barges. (Hart-Florida)
W71-06276

STATE WATER CONTROL LAW.

Va Code Ann secs 62.1-44.2 thru 62.1-44.34 (Supp 1970).

Descriptors: *Virginia, *Water quality control, *Water pollution control, *Administrative agencies, Legislation, Water policy, Administration, Adoption of practices, Regulation, Non-structural alternatives, Water pollution, Pollution abatement, Waste disposal, Sewage districts, Sewage disposal, Institutional constraints, State governments, Permits, Adjudication procedure, Decision making, Oil wastes, Oily water, Water conservation, Water management (Applied), Legal aspects.

In the interest of protecting and improving Virginia's water-quality standards, the duties, jurisdiction, and regulatory powers of the State Water Control Board are set forth in this legislation. Article One contains an enunciation of public policy regarding protection of water quality and regulation of waste discharge, and an affirmation of state control notwithstanding past discharges of waste. Article Two details the: (1) appointment, qualifications, and compensation of State Water Control Board members; (2) inspection and investigatory powers of the Board; and (3) general powers and duties of the Board. Article Three lists procedures regarding application for discharge permits and certification of industrial waste discharge. Article Four specifies the Board's powers over sewage treatment plants and facilities. Enforcement and appeal procedures, appearing in Article Five, in-

clude: (1) enforcement by injunction; (2) rules of evidence to be used by the Board; and (3) the right to judicial review of Board action. Article Six contains the penalties imposed for: (1) violation of a special order of the Board, (2) violation of a condition imposed by certification, and (3) failure to cooperate with the Board. The Board's power to regulate pollution from boats and to prevent the discharge of petroleum products is detailed in Article Seven. (Earl-Florida)
W71-06277

STATE BOARD OF HEALTH (DISPOSAL OF SEWAGE AND SOLID WASTES).
Va Code Ann secs 32-9 and 32-9.1 (Supp 1970).

Descriptors: *Virginia, *Administrative agencies, Sewage disposal, *Solid wastes, Ultimate disposal, Waste dumps, State governments, Cities, Disposal, Sewage, Legislation, Legal aspects, Wastes, Local governments, Administration.

This 1970 amendment to the Virginia code prescribes that the State Board of Health may regulate methods of sewage disposal in the state. The Board is also authorized to consider and investigate possible devices to control discharge of human waste from common carriers. In addition, the Board is required to promulgate regulations prescribing methods for disposal of solid waste in each county, city, or town in Virginia. Each state subdivision, upon request of the Board, is required to submit a plan for solid waste disposal, including sites to be utilized for disposal and cost and financing arrangements. (Hart-Florida)
W71-06278

WATER AND WASTE WATER WORKS OPERATIONS (CERTIFICATION OF WATER AND WASTE WATER OPERATIONS).
Va Code Ann secs 54-573.1 thru 54-573.17 (Supp 1970).

Descriptors: *Virginia, *Administrative agencies, *Water works, *Personnel management, State governments, Water conveyance, Water distribution (Applied), Permits, Water supply, Administrative decisions, Legislation, Legal aspects, Waste water disposal, Waste water treatment, Waste treatment, Waste water (Pollution), Public utilities, Water management (Applied), Interstate, Regulation, Personnel, Management.

A board of certification for waterworks and waste water works operators is created by this legislation. The act provides rules governing: (1) the composition of the board; (2) quorum, meetings, examinations, and expenses of board members; (3) issuance of certificates and grounds for revocation; (4) notice and hearing prior to denial, suspension, or revocation of a certificate; (5) reciprocity between states for purposes of certification; (6) interim operation of works without a certified operator; (7) collection and disposition of fees for application and renewal; (8) operator classifications; (9) the scope of qualification examinations; (10) authorization for the board to promulgate rules and regulations; (11) the effect of violating provisions of the act; and (12) appeals from actions by the board. Those holding certificates under a voluntary certification program or in charge of a works on January 1, 1971, are automatically certified for two years. (Hart-Florida)
W71-06279

ALLEN V POTTER (RIGHT TO ERECT BOAT HOIST BELOW LOW WATER MARK).
316 NYS2d 790-793 (Sup Ct 1970).

Descriptors: *New York, *Easements, *Riparian rights, *Right-of-way, Legal aspects, Boats, Boating, Boat-launching ramps, Navigable waters, Reservation doctrine, Judicial decisions, Lakes, Ownership of beds, Riparian land, Riparian waters, Public rights.

Plaintiff easement owner brought action against defendant riparian landowner for damages and an injunction to prevent interference with plaintiff's use of a boat hoist located below low water mark in front of plaintiff's right-of-way. The easement was for 'ingress, egress, and regress with the right at all times. . .to pass or repass on foot and with animals or vehicles.' The determinative issue was whether plaintiff, as a member of the public, or as holder of the right-of-way, was entitled to maintain a hoist upon public land in the bed of navigable waters. The Supreme Court of New York stated: (1) a riparian (littoral) PROPRIETOR OWNS LAND ON THE BANK OF A RIVER OR LAKE; (2) riparian rights denote the right and profit appurtenant to the upland, subject to sovereign regulation for navigation; (3) riparian rights include: (1) use of water for bathing and domestic purposes, (b) wharfage to navigable waters, and (c) access to navigable waters. Riparian rights were held not to attach to plaintiff's easement. Furthermore, the court held that plaintiff's riparian rights as a citizen were not superior to defendant's, and plaintiff could not encrocah upon defendant's rights by maintaining the hoist. Accordingly, the complaint was dismissed. (Hart-Florida)
W71-06280

THE LAW OF WATER--INTRODUCTION; WATERCOURSES; PERCOLATING AND SURFACE WATERS.
In: Powell on Real Property, Vol 5, Matthew Bender and Company, New York, p 345-438 (1962). 94 p, 435 ref.

Descriptors: *Water law, *Watercourses (Legal), *Percolating water, *Surface waters, Repulsion (Legal aspects), Riddance (Legal aspects), Surface runoff, Drainage water, Natural flow doctrine, Alteration of flow, Reasonable use, Relative rights, Riparian rights, Diversion, Legislation, Remedies, Prescriptive rights, Water pollution, Drainage districts, Percolation, Subsurface runoff, Diffusion, Legal aspects, Prior appropriation, Civil law.

Three water law topics are considered in this treatise: (1) introduction to law of water; (2) watercourses, exclusive of appropriation and (3) percolating and surface waters, exclusive of appropriation. The introduction relates the scope and organization of the treatise. In the discussion of watercourses, the following areas are examined: (1) terminology; (2) English law of natural flow; (3) American law of reasonable use; (4) reasonableness of use, including purpose, destination, quantitative facts, pollution, alteration of flow, and other types of conduct; (5) alteration of permissible use by methods other than prescription; (6) alteration of permissible uses by prescription; (7) remedies; (8) state legislation (not including appropriation statutes); and (9) federal legislation. The percolating and surface waters section includes: (1) terminology; (2) percolating waters, including the English rule of unrestricted privilege, American evolution of reasonable use, California rule of correlative rights, and statutory conservation; and (3) surface waters, including the natural flow doctrine, common enemy approach, reasonable use, and statutory drainage districts. The three sections treated purport to cover the entire field of water law with the exception of the development and status of problems centering on the law of appropriation. (Hart-Florida)
W71-06281

GOVERNMENTAL RESPONSIBILITY FOR WASTE MANAGEMENT IN URBAN REGIONS,
For primary bibliographic entry see Field 05G.
W71-06282

SOIL AND WATER LOANS; LAND CONSERVATION AND DEVELOPMENT LOANS.
Department of Agriculture, Washington, D.C.

Code of Federal Regulations, Title 7, Chap XVIII, secs 1821.51 thru 1821.87 (1970). 8 p.

Descriptors: *Loans, *Farm management, *Water resources development, *Rural areas, Soil management, Costs, Federal government, Governments, Financing, Capital, Government finance, Investment, Credit, Conservation, Drainage, Forestry, Water management (Applied), Pastures, Pasture management, Water policy, Farms.

Pursuant to section 304 of the Consolidated Farmers Home Administration Act of 1961, provisions for soil and water loans are hereby established. Loan preferences and objectives are defined, and the qualifications for acquiring a loan are explained. Enumerated herein are the purposes for which such loans may be used. The following procedural and administrative requirements are considered: (1) terms of loans, (2) special requirements, (3) security requirements, (4) compliance with special laws and regulations, (5) loan processing and related functions, and (6) subsequent soil and water loans. Land conservation and development loans are provided in accordance with section 203 of the Appalachian Regional Development Act of 1965. The following are explained under land conservation and development loans: (1) eligibility; (2) loan purposes; (3) special requirements; (4) security requirements; and (5) procedures for making, approving, processing, and closing loans. (Robinson-Florida)
W71-06283

JACOBS V UNITED STATES (COMPENSATION FOR LAND RENDERED MORE SUSCEPTIBLE TO OVERFLOW).
45 F2d 34-39 (5th Cir 1930).

Descriptors: *United States, *Condemnation, *Backwater, *Easements, Compensation, Eminent domain, Payment, Contracts, Rivers, Farming, Riparian land, Riparian rights, Dams, Design flow, Navigable rivers, Legal aspects, Judicial decisions.

Plaintiff riparian landowner sought compensation for land which had become more susceptible to overflow after defendant United States had erected a dam downriver. Defendant offered to purchase a flowage easement from plaintiff, but plaintiff rejected the offer and filed the instant action. The Fifth Circuit Court of Appeals observed that plaintiff could only recover upon an implied contract theory. Since defendant had foreseen that plaintiff's land would be damaged and require compensation, an implied contract was found. Furthermore, it was noted that a riparian owner had the right to enjoy the natural flow of the river without the burden of an artificial hindrance. Hence, the court stated that no public easement could arise without grant, dedication, or condemnation with adequate compensation, and held that plaintiff was entitled to damages. (Hart-Florida)
W71-06296

JONES V LOUISVILLE AND NASHVILLE RY (RECOVERY FOR FLOOD DAMAGE BY CONTRIBUTOR THERETO).
233 Ky 152, 25 SW2d 31-32 (1930).

Descriptors: *Kentucky, *Culverts, *Remedies, *Flooding, Surface drainage, Obstruction to flow, Legal aspects, Judicial decisions, Damages, Highways, Local governments, Channels, Floods, Ditches, Surface waters, Drainage, Sediment, Railroads, Natural flow.

Plaintiff landowner sued defendants, a railroad, the county and another landowner, to recover damages for flooding of his property. The county had acquired a right-of-way for the state highway commission to build a new highway, but contended that it could not be liable for negligent construction. The other landowner build a culvert from the highway to the back edge of plaintiff's lot, but claimed that if plaintiff had not extended the culvert to a small ditch on the railroad's property, the flooding would not have occurred. The railroad, whose drainage ditch clogged, backing water up onto plaintiff's property, also asserted that the flooding would not have occurred if plaintiff had

not connected its ditch with the larger culvert, bringing sediment into the ditch. The lower court sustained the county's demurrer and directed verdicts for the other defendants. The Court of Appeals of Kentucky affirmed, saying one who contributes to his own injury cannot recover for his wrong. (Morris-Florida)
W71-06303

CITY OF HARRISONVILLE V W S DICKEY CLAY MFG CO (ENJOINING CITY'S SEWAGE DISPOSAL INTO STREAM AS TEMPORARY NUISANCE).
61 F2d 210-215 (8th Cir 1932).

Descriptors: *Sewage disposal, *Municipal wastes, *Water pollution, *Pollution abatement, Sewage treatment, Sewage, Treatment facilities, Cities, Sewage effluents, Local governments, Water pollution sources, Waste water disposal, Riparian rights, Riparian land, Riparian waters, Remedies, Damages, Property values, Compensation, Judicial decisions, Streams.

Plaintiff corporation sued to recover damages and to enjoin defendant city from discharging sewage into a stream which flowed through plaintiff's land, thereby destroying its use as rented pasture. Plaintiff contended that defendant's sewage disposal was a temporary nuisance which could be abated by improving defendant's treatment system and also claimed as damages the cost of cleaning and restoring the banks of the stream. Defendant argued that the nuisance was permanent since the city could be afford the improvements and contended that plaintiff could only recover the difference in the land's value before and after the discharge. The Eighth Circuit Court of Appeals noted that a city is not justified in discharging sewage to the injury of other landowners and held that the nuisance was temporary, entitling plaintiff to injunctive relief. However, the court held that plaintiff was not entitled to the cost of cleaning the bank since nature would do so once the nuisance was abated. The cost of cleaning the banks was out of proportion to the value of the land and the actual damage to the land. (Liptak-Florida)
W71-06304

TALLASSEE POWER CO V CLARK (RIPARIAN RIGHTS IN RIVER BED AND IN FUTURE FLOOD WATERS AND ALLUVIAN).
77 F2d 601-605 (6th Cir 1935).

Descriptors: *Riparian rights, *Accretion (Legal aspects), *Islands, *River beds, Dams, Hydroelectric plants, Navigable rivers, Rivers, Navigable waters, Beds, Natural flow, River flow, Reasonable use, Flood waters, Floods, Flood control, Overflow, Riparian land, Riparian waters, Silts, Sediments, Silting, Relative rights, Water rights, Legal aspects, Judicial decisions.

Plaintiff brought action to recover for damages to farm lands on an island he owned in a navigable river in Tennessee. Plaintiff contended that the damage was caused by defendant's hydroelectric dams in North Carolina. Plaintiff contended that the dams increased the flow of water in the river, thereby destroying a ford which was plaintiff's only means of access of the island, and that the dams eliminated the usual spring overflow of the river, thereby depriving plaintiff of the alluvion, silt, and sediments which were usually deposited on the island and greatly enriched the soil. Defendant contended that: (1) plaintiff had no vested right to the use of the river bed as a ford since riparian owners own only to the low water mark in navigable rivers; and (2) the sediment deposits were caused by unusual floods, which are common enemies, rather than annual freshets; and (3) riparian owners have no vested right to future deposits. The Sixth Circuit Court of Appeals noted that the law clearly limits riparian title to the low water mark and reversed a judgment for plaintiff as to the destruction of the ford. Noting that riparian owners have no vested right to future accretions along the shore, the court distinguished plaintiff's claim to future deposits on his own land and found that riparian owners have a right to the flow of ordinary flood waters. The court reversed the judgment for defendant as to the floods and remanded for trial, noting that liability must depend on whether the dams constituted an unreasonable use of defendant's riparian rights. (Liptak-Florida)
W71-06305

THE BUREAU OF RECLAMATION'S ROLE IN AMERICA'S GROWTH,
Bureau of Reclamation, Washington, D.C.
Ellis L. Armstrong.
Water Resources Bulletin, Vol 7, No 1, p 175-184, February 1971.

Descriptors: *Water resources development, Land reclamation, Irrigation, Flood control, Recreation, Fish management, Wildlife management, Interbasin transfers.
Identifiers: *Bureau of Reclamation, *National development.

The Bureau of Reclamation was created to implement the Reclamation Act of 1902 and subsequent legislation to conserve and develop the water resources of the western states for maximum efficient use. This has been accomplished by the planning and construction of major multiple use projects which now supply water to approximately eight million acres of land which annually produce 52 million tons of food and fiber with a gross crop value of approximately $2 billion. Fifteen million people are served with municipal and industrial water supplies and hdyroelectric power from Bureau projects now returns $160 million annually to the Tresury. Flood control, recreation, and fish and wildlife enhancement are other major benefits. The Bureau of Reclamation is now undertaking a Westwide Survey of water resources and of the needs of the future which is more far-reaching than anything heretofore accomplished. The information accumulated during this ten-year survey will determine whether there is a necessity for consideration of major interbasin transfer of water supply. (Davis-Chicago)
W71-06308

LEGAL ASPECTS,
Iowa Univ., Iowa City. Coll. of Law.
For primary bibliographic entry see Field 05G.
W71-06446

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION, ELBA, ALABAMA, PEA RIVER, WHITE WATER AND BEAVER DAM CREEKS.
Corps of Engineers, Mobile, Ala.
For primary bibliographic entry see Field 04A.
W71-05867

FLOOD PLAIN INFORMATION, CALLEGUAS CREEK, VICINITY OF MOORPARK, VENTURA COUNTY, CALIFORNIA.
Corps of Engineers, Los Angeles, Calif.
For primary bibliographic entry see Field 04A.
W71-05868

ORGANIZING WATER POLLUTION CONTROL: THE SCOPE AND STRUCTURE OF RIVER BASIN AUTHORITIES,
Harvard Univ., Cambridge, Mass.
Marc J. Roberts.
Public Policy, Vol XIX, No 1, p 75-141, Winter 1971.

Descriptors: *Water pollution control, Decision-making, Water quality, Marginal cost, Economic evaluation, Economies of scale, Cost-benefit analysis, Prices, Riverbasin planning.
Identifiers: *Externalities, Regional planning, Social welfare function.

This paper explores the organization of decisici making by governments on water pollution contr The author outlines possible criteria to evaluate gional institutions involved in water quality contr One criteria cited requires that agencies be of sui cient scale to consider all relevant externaliti The problem of optimal institutional choice discussed with the author advocating a unified riv basin agency. The agency would levy servi charges on industrial waste sources and have sc power to dispose of waste in the river basin. T charges are set on the basis of the marginal cost the system of maintaining water quality standar set by state and Federal agencies. The auth discusses further complexities of regional wat quality management often omitted from econom models of optimal choice. (Siegenthaler-Rutgers)
W71-05936

FLOOD PLAIN INFORMATION, KINGFISHE AND UNCLE JOHN'S CREEKS, KINGFISHE OKLAHOMA.
Corps of Engineers, Tulsa, Okla.
For primary bibliographic entry see Field 04A.
W71-06119

THE SOCIAL AND ECONOMIC NEED FO FLOODPLAIN REGULATION,
Soil Conservation Service, Denver, Colo.
For primary bibliographic entry see Field 04A.
W71-06131

FLOOD PLAIN INFORMATION, ONTONAGO RIVER, ONTONAGON, MICHIGAN, AND LAK SUPERIOR SHORELINE, ONTONAGON COU TY, MICHIGAN.
Stanley Consultants, Inc., Muscatine, Iowa.
For primary bibliographic entry see Field 04A.
W71-06232

ECOLOGY AND SPATIAL ANALYSIS,
Michigan Univ., Ann Arbor. Dept. of Geography.
James D. Clarkson.
Annals of the Association of American Geog raphers, Vol 60, No 4, p 700-716, December 197 2 fig, 33 ref.

Descriptors: *Ecology, *Methodology, *Environ mental effects, Theoretical analysis, *Planning *Water resources development, Geographical re gions.
Identifiers: *Spatial analysis, Environmental deter minism, Adaptive research.

This article examines some of the theoretical an methodological considerations of importance t water resources management and planning. Placin an ecological approach in the general framework o American geographic thought indicates the usefuln ness of distinguishing 2 trends in the developmen of this thought--the one ecological, the other spa tial. American geography tended to reject the ecological approach because it was identified at an early period with environmental determinism. A spatial, non-functional, approach became domi nant. Although the two approaches are two ends o a continuum, and thus connected, they arise from and lead to different sets of questions which involve different approaches and different bodies o theory. The ecological approach may be divide into four imprecise types--biological, human, cul tural, and urban-political. The cultural-ecologica approach is particularly useful in analyzing obsta cles to innovation acceptance in agricultural development because it emphasizes the analysis o existent systems from different viewpoints. Four sets of reality, or viewpoints, can be distinguished in this context--that of the scientist-observer, that of the change-agent, that of the cultivator, and that of the ideal-set of the cultivator. Only when the overlaps and conflicts of these sets are recognized can a realistic appraisal be made. This is only a sin gle instance of the potential of an ecological ap proach. Spatial theory and ecological theory have not yet been joined. The evident usefulness of both indicates the importance of attempting such a join

ing, and the futility of arguing for the ascendence of one-over the other. (Davis-Chicago)
W71-06317

6G. Ecologic Impact of Water Development

THE ECOLOGY AND OCEANOGRAPHY OF SEWER OUTFALLS,
Scripps Institution of Oceanography, La Jolla, Calif.
M. A. Barnett, R. E. Davis, M. E. Silver, and R. R. Warner.
A seminar held at Scripps Institution of Oceanography, Spring 1969. Scripps Institution of Oceanography, La Jolla, California, 1969. 19 p, 11 ref. SIO Ref No 70-18.

Descriptors: *Ecology, *Balance of nature, *Oceanography, *Outlets, *Water pollution, *Reviews, Effluents, Discharge, Water quality standards, Food chains, Coastal engineering, Marine animals, Marine microorganisms, California, Sea water, Statistics, Sampling, Analytical techniques, Environmental effects.
Identifiers: *Research objectives, *Research program planning, Ecological effects.

A special graduate seminar was held at Scripps in 1969 to examine standards in use for defining 'pollution' in coastal waters of California, to survey existing and planned ocean outfalls, to determine what type of investigations are required, and to examine reports of a number of investigations for their appropriateness and adequacy for the stated purpose. The participants of the seminar made the following recommendations: (1) all research proposals and/or contracts should be submitted to external, independent, objective referees; (2) more research and survey effort should be applied to problems of: developing ecological 'indicators' of pollution, biochemical and physiological indices of pollution, measurement of the persistence of non-degradable fractions, particularly those of known toxicity, concentration factors in organisms, the statistical design of monitoring programs, methods of data analysis, review and presentation; (3) basic research needs to be done on: physiology of marine organisms, sampling of marine organisms, community ecology and food chain structure, dynamics of concentration factors through food chains, currents, turbulence, eddy diffusivity and mixing in the nearshore regions; (4) there should be more centralization of effort in the study of effects and regional, long term planning of coastal waste disposal; (5) a great deal of effort needs to be put into the development of clear, unambiguous statements as to the standards to be maintained (or objectives to be met) for coastal water quality. (Poertner)
W71-05928

JAMAICA BAY AND KENNEDY AIRPORT: A MULTIDISCIPLINARY ENVIRONMENTAL STUDY.
Jamaica Bay Environmental Study Group, N.Y.

National Academy of Sciences, National Academy of Engineering, Washington, DC, (1971). Two volumes, 23 fig, 2 map, 2 photo, 31 tab, 358 ref, 2 append.

Descriptors: *Bays, *New York, *Airports, *Environmental effects, Ecology, Aquatic habitats, Environment, Fishing, Aquatic environment, Recreation, Inlets (Waterways), Water pollution, Water pollution control, Pollution abatement, Sewage, Dredging, Runways, Pollutants, Landfills, Water pollution sources, Municipal wastes, Water pollution treatment, Administrative agencies, Estuaries, Legal aspects.
Identifiers: *Jamaica Bay.

Under the auspices of the National Academy of Sciences and the National Academy of Engineering, the Environmental Studies Board produced this multidisplinary evaluation of the potential impact of the expansion of Kennedy Airport into Jamaica Bay. Dredging and landfills for airport and commercial construction have significantly altered Jamaica Bay, but it still functions as an imperfect marine environment and bird refuge. The benefits and costs of various means of improving air transportation are examined in the study, emphasizing that projected costs must include the value of ensuing environmental deterioration and diminution of the amenability of the area to residential and recreational development. Problems caused by sewage discharged into the Bay are also discussed. The roles of the various community, city, state, regional and federal agencies which must be involved in determining the future of the Bay area are examined. Regulatory solutions to the aircraft noise problem in the area surrounding the airport are discussed. The Board contends that regulatory measures controlling land use and inducing utilization of quieter planes are preferable to construction of more runways in Jamaica Bay. Further dredging and landfill would significantly worsen the environmental decay of the area, while not measurably improving the quality of air transportation above that level which may be obtained by alternative measures. (Hart-Florida)
W71-06045

07. RESOURCES DATA

7A. Network Design

A PROPOSED STREAMFLOW-DATA PROGRAM FOR NEBRASKA,
Geological Survey, Lincoln, Neb.
H. D. Brice, F. B. Shaffer, and N. G. Stuthmann.
Geological Survey open-file report 1970. 63 p, 4 fig, 16 tab, 14 ref.

Descriptors: *Streamflow, *Data collections, *Hydrologic data, *Surface waters, *Nebraska, Evaluation, Planning, Watershed management, Streams, Regression analysis, Flood plain zoning, Gaging stations, Runoff, Discharge measurement, Peak discharge, Average flow, Water quality, Environmental effects.
Identifiers: Streamflow characteristics, Peak discharge recurrence intervals.

An evaluation of the available discharge data for Nebraska streams was made to provide guidelines for planning the future data-collection program. The basic steps in this evaluation procedure were (1) definition of the long-term goals of the program in quantitative form, (2) examination and analysis of all available data to determine which goals have already been met, and (3) consideration of alternate procedures and techniques to meet the remaining goals. In order to evaluate the stream records, regression analyses were made of discharge records at selected gaging stations. The analysis showed that application of the regression equations will not provide estimates of selected flow characteristics within the accuracy goals specified for either minor or principal streams. Proposals for changes in the present program include the conversion of some complete-record gaging stations to flood-record stations, establishment of additional complete-record stations on small drainage basins, and investigation of techniques for improving correlative estimates of low flow. Proposals also are made for expanding programs to protect the physical environment of streams. (Woodard-USGS)
W71-06128

THE SURFACE INSTRUMENT NETWORK OF THE UPPER COLORADO RIVER PILOT PROJECT,
Western Scientific Services, Inc., Fort Collins, Colo.
L. W. Crow, C. F. Chappell, and G. W. Jones.
Proceedings 38th Annual Meeting of Western Snow Conference, April 21-23, 1970, Victoria, British Columbia, Canada: Printed by Colorado State Univ, Fort Collins, p 16-23, 1970. 8 p, 6 fig, 2 tab.

Descriptors: *Colorado River basin, *Weather modification, *Data collections, *Meteorological data, *Instrumentation, Precipitation gages, Networks, Evaluation, Water yield improvement.
Identifiers: San Juan Mountains (Colo).

The Upper Colorado River Pilot Project's goal is to augment precipitation in a 3,300 square mile area in the San Juan Mountains of southwestern Colorado through modification of wintertime cold orographic clouds. The first project phase, initiated in November, 1968, provided for installation and operation of a network of surface instruments to collect meteorological data to provide an understanding of the physical processes and sequence of storm events which occur in this area and to permit evaluation of precipitation augmentation operations. The instrument network design, procedures developed for areal distribution of precipitation, are discussed, and examples of precipitation patterns are presented. (See also W71-06133) (Knapp-USGS)
W71-06136

SNOW SURVEY TELEMETRY NETWORKS AND FUTURE PLANS,
Soil Conservation Service, Anchorage, Alaska. Water Supply Forecasting Branch; and Soil Conservation Service, Anchorage, Alaska. Snow Survey for Alaska.
William G. Shannon, and Ted G. Freeman.
Proceedings 38th Annual Meeting of Western Snow Conference, April 21-23, 1970, Victoria, British Columbia, Canada: Printed by Colorado State Univ, For Collins, p 98-101, 1970. 4 p.

Descriptors: *Telemetry, *Snowpacks, *Snowmelt, *Water yield, *Runoff forecasting, Snow surveys, Data collections, Hydrologic data, Runoff, Streamflow forecasting, Rainfall-runoff relationships.
Identifiers: *Snow survey telemetry.

To satisfy legislative, regulatory agency, and user demands for snowmelt water yield data, a telemetry system is proposed and its major properties are outlined. An ideal telemetry system would account for total precipitation, distribution, and depletions on a 'real time' basis for the total water-producing areas and their subwatersheds. Also, knowledge is needed to predict these same factors accurately for a future period. A scientist must prescribe the parameters to be collected, the frequency of sampling, and the distribution of stations or areal coverage before telemetry systems are designed and installed. The legislative authority and administrative policy must be compatible to achieve the overall objective. The electronic telemetry system should obtain and record information automatically on a preset time interval. The recorded information should be in such form that it can be processed by ADP techniques and retrieved from storage. The problem is to obtain, at a reasonable cost, hardware that is completely reliable and that operates unattended for nine months or longer at high-elevation data sites. This problem can be handled. (See also W71-06133) (Knapp-USGS)
W71-06148

THE AUTOMATIC HYDROLOGICAL RADIO REPORTING NETWORK, NEW ENGLAND DIVISION, CORPS OF ENGINEERS,
Office of the Chief of Engineers (Army), Washington, D.C. Civil Works Directorate.
Carleton H. Gray.
Proceedings 38th Annual Meeting of Western Snow Conference, April 21-23, 1970, Victoria, British Columbia, Canada: Printed by Colorado State Univ, Fort Collins, p 102-107, 1970. 6 p, 5 fig.

Descriptors: *Flood forecasting, *Warning systems, *Telemetry, *Data collections, *Data transmission, Hydrologic data, Flood control,

Water levels, Flood protection, Reservoir operation, Data processing, Digital computers.
Identifiers: *Hydrologic data network.

As an integral part of a comprehensive plan of protection from flood hazards in New England area, the Corps of Engineers has designed an automatic data collection network. This radio operated network provides extensive hydrologic data including river, reservoir and tide levels, wind velocity and direction, barometric pressure and precipitation levels in five major New England river basins. At the central station the reporting network is interfaced directly with an IBM 1130 which can automatically interrogate the entire system and provide a complete printout in three minutes. (See also W71-06133) (Knapp-USGS)
W71-06149

7B. Data Acquisition

HYDROLOGY OF LIMESTONE TERRANES, PHOTOGEOLOGIC INVESTIGATIONS,
Geological Survey of Alabama University.
For primary bibliographic entry see Field 02F.
W71-05838

BOTTOM SEDIMENT SAMPLING,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
P. G. Sly.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 883-898, 1969. 16 p, 6 fig, 3 tab, 6 ref.

Descriptors: *Sampling, *Bottom sediments, *Lake Ontario, Great Lakes, Instrumentation, Equipment, Cores, Data collections, Core drilling, Sediments, Sedimentology, Surveys, Lakes.
Identifiers: *Bottom sediment sampling.

Tests with sampling equipment during 1967 and 1968 in Lake Ontario showed that some of the bottom samples were badly disturbed. As a result of these tests, further extensive trials of bottom sampling equipment were conducted in Georgian Bay in 1968. These were designed to test the disturbance of the bottom sediments caused by ship movement and to test the efficiency and suitability of various types of sampling devices. It was found that under typical sampling conditions, bottom disturbance was induced by the ship when the total water depth was less than about 6 m. It was also induced by the ship when the total water depth was less than about 6 m. It was also found that the ship, during typical sampling procedures in deeper water, induced disturbance in the water column, beneath it, to a depth of at least 14 m. Tests were conducted with three types of Gravity corer, two multiple corers, and six Grab samplers. These tests were designed to show their usefulness for both biological and geological samplings. All three gravity corers proved efficient for particular tasks. The most successful bottom grab samplers were found to be the Ponar grab and the Shipek bucket sampler. (See also W71-05561) (Knapp-USGS)
W71-05886

A STUDY OF FRESHWATER SAND GRAIN SURFACES BY SCANNING ELECT RON MICROSCOPY,
Illinois Univ., Urbana. Dept. of Geology.
Ronald D. Stieglitz.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 351-356, 1969. 6 p, 5 fig, 13 ref. NSF Grant GA-1239; PHS Grant PH-FR-07030.

Descriptors: *Sands, *Electron microscopy, *Sediments, *Lakes, *Dunes, Lake Michigan, Great Lakes, Sedimentology, Quartz, Mineralogy, Stratigraphy, Paleolimnology.
Identifiers: *Electron microscopes (Scanning).

Five samples of sand from several different environments were studied with the scanning electron microscope. Samples were taken from a small lake in Door County, Wisconsin, Lake Michigan beaches, dunes in Door County, and the Indiana dunes. Elaborate sample preparation is not necessary, and observation of shape and rounding as well as very small textures imprinted on the surfaces are possible. Large numbers of grains can be routinely examined so that major textures and grain types can be easily located and their frequency more accurately estimated. Quartz as well as other mineral grains were studied. Textures are distinctive and add much information concerning physical and chemical conditions in the depositional environment. Several quartz grains were etched in hydrofluoric acid for periods of 5 to 15 min to study the effects of chemical attack and crystallographic control on surface textures. (See also W71-05561) (Knapp-USGS)
W71-05887

INTERNAL WAVES OF THE SECOND VERTICAL MODE IN LAKE HURON,
Waterloo Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 02H.
W71-05896

SOME UNUSUAL SURFACE WATER TEMPERATURE PATTERNS IN THE GREAT LAKES, AS DETECTED BY AIRBORNE RADIATION THERMOMETER SURVEYS,
Meteorological Service of Canada, Toronto (Ontario).
J. G. Irbe.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 583-607, 1969. 25 p, 21 fig, 5 tab, 25 ref.

Descriptors: *Water temperature, *Water circulation, *Great Lakes, *Weather, *Remote sensing, Aircraft, Lake Ontario, Lake Erie, Meteorology, Data collections, Thermometers.
Identifiers: Airborne radiation thermometry.

Since 1966 the Meteorological Service of Canada has undertaken a program of monthly surface water temperature surveys of the Great Lakes bordering on Canada using an airborne infrared temperature sensing instrument. During the three year period that the program has been in progress, many interesting features of the distribution of surface water temperature have been found. Maps showing some of the more unusual isotherm patterns deduced from these surveys are presented and discussed with reference to lake circulation and meteorological conditions. (See also W71-05561). (Knapp-USGS)
W71-05898

LARGE-SCALE DIFFUSION STUDIES AT NIAGARA RIVER MOUTH, LAKE ONTARIO,
Canada Center for Inland Waters. Department of Energy, Mines and Resources, Burlington (Ontario).
C. R. Murthy.
In: Proceedings Twelfth Conference on Great Lakes Research, May 5-7, 1969, University of Michigan, Ann Arbor: International Association for Great Lakes Research, p 635-651, 1969. 17 p, 17 fig, 10 ref.

Descriptors: *Mixing, *Lake Ontario, *Dispersion, *Diffusion, Dye releases, Tracers, Rivers, Streamflow, Current meters, Water circulation, Currents (Water), Great Lakes, Sampling, Fluorometry.
Identifiers: *Niagara River.

Some results of large scale dye plume experimen conducted during the summer of 1968 at the mou of the Niagara River, Lake Ontario, are presente Cross-plume concentration and diffusion chara teristics of the dye plume at the river mouth wer analyzed. Based on the observed data from a co tinuous point source investigation, it appears th the efflux from the river is rapidly mixed with th main body of the lake, possibly due to the com bined action of large scale convective eddies of th stream in the early stages of diffusion (correspond ing to river mixing) and the regular dispersal due t lake currents and turbulence at later stages. (Se also W71-05561). (Knapp-USGS)
W71-05901

FORMATION EVALUATION BY INSPECTIO WITH THE BOREHOLE TELEVIEWER,
Mobil Research and Development Corp., Dalla Tex.
J. Zemanek.
Geophys, Vol 35, No 2, p 254-269, Apr 1970. 16 p 13 fig, 7 ref.

Descriptors: Geophysics, Seismic investigations *Boreholes, Fissures, Measurement, Field tests *Borehole cameras, *Borehole geophysics, *Wel logging, *Television, Geologic investigations *Geophysical prospecting, *Orientation, *Frac tures (Geology).
Identifiers: Site selection.

The televiewer takes an oriented acoustic picture of the inside of the borehole in the form of a con tinuous well log using high-frequency sound (abou 2 megahertz). The resulting log is a representation of the borehole wall as if it were split vertically along magnetic north and laid out flat. Inducte and natural fractures are defined. Well bores can be filled with any homogenous liquid (oil, water, o drilling mud). Resolution of the tool is sufficient t locate fractures 1/32 in. wide. Examples of natura fractures, drilling-induced fractures, and fracture orientation are discussed. (USBR)
W71-05916

INVESTIGATIONS OF THE TECHNIQUES OF PURIFICATION OF ALGAL CULTURES: ELABORATION OF METHODS APPLICABLE TO DESMIDS, FILAMENTOUS CYANOPHYTES, AND DIATOMS, (IN FRENCH),
Centre National de la Recherche Scientifique, Gif-s sur-Yvette (France). Centre de Recherches Hydrobiologiques.
M. Tassigny, G. Laporte, and R. Pourriot.
English summary. Annales de l'Istitut Pasteur, Vol 117, No 1, p 64-75, 1969. 2 tab, 22 ref.

Descriptors: *Laboratory tests, *Algae, Cultures, Diatoms, Cyanophyta, Bioassay, Test procedures.
Identifiers: *Pure algal cultures.

Several methods of obtaining pure cultures of algae were subjected to critical review: dilution and use of pipettes, dilution following an ultrasonic treatment, use of antibiotics, and germination of sterilized spores. Each of these methods offered a possibility of obtaining pure cultures of a limited number of species. The simple technique of dilution and use of pipettes provided the greatest chance of success. A proper choice of the method and certain modifications permitted isolation of Microsteriae, Closterium, Draparnaldia, Nitzschia, and several filamentous Cyanophyceae. (Wilde-Wisconsin)
W71-06002

EVALUATION OF AN AUTOMATIC CHEMICAL ANALYSIS MONITOR FOR WATER QUALITY PARAMETERS,
New York State Dept. of Health, Albany. Div. of Labs and Research.
For primary bibliographic entry see Field 05A.
W71-06005

NFRARED PHOTOS CAN MAP SOILS,
Nebraska Univ., Lincoln. Agricultural Experiment Station.
Larry J. Cihacek, and James V. Drew.
Quarterly Serving Farm, Ranch, and Home, Vol 17, No 1, Spring 1970, p 4-8. 9 fig.

Descriptors: *Remote sensing, *Infrared radiation, *Soil-water-plant relationships, *Soil surveys, *Eluvium, Moisture stress, Drainage, Light penetration, Flood irrigation, Harvesting, Correlation analysis, Color, Aerial photography, Maps, Moisture availability, Photosynthesis, Valleys, Marshes, Humus, Seasonal, Precipitation, Soil moisture, Water table, Radiation, Range management, Soil management, Nebraska, Satellites (Artificial).
Identifiers: Leaf geometry, Mowing, Sand Hills (Neb), Semi-arid lands.

Infrared photos from remote sensing satellites of Nebraska's semi-arid Sand Hills help map soils for decisions in soil and range management. Soil, vegetation and water relations allow the mapping of this 19,300-square-mile area because of their ability to reflect invisible, near-infrared radiation. Soil differences across this wind-blown region are due to variations in soil moisture and vegetation. Well-drained soils have deep water tables, and vegetation must depend on seasonal precipitation for soil moisture. Drought stress in summer reduces accumulation of dark surfaces of humus. In swales and valleys, poorly drained soils have shallow water tables, which form marshes and humus-rich layers. Plants differ in near-infrared reflection properties because of variations in photosynthesis activity, moisture content, and leaf geometry. Actively growing, turgid plants reflect near-infrared light; moisture-deficient or dormant plants do not. Late May photos taken from 10,000 to 20,000 feet above ground in 1969 showed best correlation with ground surveys because of moisture effects on vegetation. Mowing, harvesting, and flood irrigation influenced reflectance. Conventional color photos at high altitudes are of limited value because light is scattered by haze. Infrared is slightly scattered. Figures show typical soil profiles and soil types from infrared and ground surveys. (Popkin - Arizona)
W71-06058

WATER QUALITY TELEMETRY FINAL PROGRESS REPORT,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 05G.
W71-06069

AN INTERFEROMETRIC TECHNIQUE FOR TEMPERATURE AND CONCENTRATION MEASUREMENT FOR AN AIR-WATER INTERFACE,
Virginia Univ., Charlottesville.
For primary bibliographic entry see Field 05A.
W71-06090

AERIAL PHOTOGRAPHIC TRACING OF PULP MILL EFFLUENT IN MARINE WATERS,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W71-06258

TV INSPECTION AND IN-PLACE GROUTING OF SEWERS,
R. H. White.
Water Wastes Eng, Vol 5, No 9, p 72-74, Sep 1968.

Descriptors: *Inspection, *Cost-benefit analysis, *Equipment, Grouting, Sewers.
Identifiers: *Austin, Texas, *Television inspection, sanitary sewers.

Experiences of Austin, Texas, in using television camera inspection and inplace grouting in sewers are reported. The first experience with television inspection was so successful that lines in question were rehabilitated at a cost less than twenty thousand dollars, instead of two hundred and forty thousand dollars as was considered previously. Television inspection equipment proved to be durable, and down-time was quite low. Television inspection has forced contractors and other utilities to respect sanitary sewers.
W71-06427

7C. Evaluation, Processing and Publication

SUMMARY OF DATA ON TEMPERATURE OF STREAMS IN NORTH CAROLINA, 1943-67,
Geological Survey, Washington, D.C.
Thomas H. Woodard.
For sale by the Superintendent of Documents U.S. Government Printing Office, Washington, D.C. 20402 - Price $0.75. Geological Survey Water-Supply Paper 1895-A, 1970. 39 p, 1 fig, 1 plate, 2 tab.

Descriptors: *Water temperature, *Streams, *North Carolina, *Hydrologic data, *Data collections, Average, Fluctuation, Standards, Thermal water.
Identifiers: *Stream temperatures, Basic-data compilation.

Stream temperature data collected by the U.S. Geological Survey in cooperation with the State of North Carolina during the period 1943-67 are summarized. Values determined from 850 station years of record from 176 locations throughout the state are shown in two tables. Thirty-one percent of the station years are monthly records, 50 percent are daily, and 19 percent are continuous. Temperature tabulations include average monthly, average annual extremes observed for the period of record at each location, average of monthly maximums, average of daily maximums, average daily, average of daily minimums, and average of monthly minimums. (Woodard-USGS)
W71-05855

WATER RESOURCES OF THE BLACK RIVER BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Washington, D.C.
R. L. Knutilla.
For sale by US Geological Survey, Wash, DC, 20242, price $1.75. Geological Survey Hydrologic Investigations Atlas HA-338, 3 sheets, 1970. Text, 6 fig, 7 map, 2 tab.

Descriptors: *Water resources, *Surveys, *Hydrologic data, *Michigan, *Water resources development, Hydrogeology, Streamflow, Duration curves, Profiles, Hydrographs, Data collections, Topography, Geology, Geomorphology, Water supply, Water yield, Water quality.
Identifiers: *Black River Basin (Mich).

This 3-sheet hydrologic atlas is a part of a comprehensive study of the water resources of southeastern Michigan. The purpose of the atlas is to provide information on (1) the physical features of Black River and its tributaries, (2) the characteristics of streamflow, (3) the quality of ground and surface water, and (4) the groundwater aquifers of the area. Water from streams is of the calcium magnesium bicarbonate type and is very hard. Stream water is generally high in sulfates and, locally, high in chlorides. Water from shallow wells in the glacial drift is of the calcium magnesium bicarbonate type. Water from deep wells in the glacial drift is of the calcium magnesium bicarbonate, sodium bicarbonate or sodium chloride types. Water from bedrock wells may be of the calcium magnesium bicarbonate, sodium bicarbonate, sodium chloride, or mixtures of these types. Most wells completed in glacial drift in the southeastern one-third of the basin will yield only small supplies of water, and some will fail to yield even the small amount needed for a domestic supply. Somewhat larger supplies may be obtained from the glacial drift in the north and western parts of the basin. The outwash areas in the headwaters of Mill and Elk Creeks are the most favorable for obtaining large supplies of water. Maps show quality of water, physiography, geology, well yields, and groundwater levels. Stream profiles, hydrographs, tables, duration curves, frequency curves, and tabular presentation are used to summarize data. (Knapp-USGS)
W71-05869

GROUNDWATER RECONNAISSANCE OF THE GREEN RIVER BASIN, SOUTHWESTERN WYOMING,
Geological Survey, Washington, D.C.
George E. Welder.
For sale by U Geological Survey, Washington, DC 20242-price $1.00. Geological Survey Hydrologic Investigations Atlas HA-290, 3 sheets, 1968. Text, 6 fig, 5 map, 2 tab.

Descriptors: *Water resources, *Groundwater, *Maps, *Hydrologic data, *Wyoming, Geologic investigations, Surface waters, Geology, Aquifers, Aquifer characteristics, Water yield, Water quality, Water wells, Water levels, Chemical analysis, Streams, River basins, Springs, Groundwater recharge, Precipitation (Atmospheric), Hydrology, Data collections, Water sources, Seepage.
Identifiers: *Green River Basin (Wyoming), Hydrologic Atlas, Groundwater reconnaissance.

This report, consisting of a Hydrologic Atlas of 5 maps on 2 sheets and a separate text, describes the occurrence and quality of groundwater in the Green River structural basin of Wyoming. Some general information concerning surface water has been included because of the close relationship of groundwater to surface water in parts of the basin. The area consists of approximately 10,000 square miles, which is about 60% of the Wyoming part of the Green River drainage basin. The rocks that underlie the area range in age from Precambrian to Recent. Rocks at the surface are divided as follows: 82% of Tertiary and Quaternary age, 2% of Paleozoic and Mesozoic age, and 16% of Precambrian age. Recharge to groundwater reservoirs is mainly by seepage from precipitation and streams. Yields of most wells range from about 10 to 100 gpm. The quality of groundwater ranges from very poor to excellent with a range of dissolved solids from less than 500 to more than 3,500 ppm. The water in most of the perennial streams contains less than 500 ppm total dissolved solids. Two exceptions are the reaches of Big Sandy Creek below the Eden-Farson irrigation project and Blacks Fork below the Lyman irrigation project. Total dissolved solids in the surface water of these reaches generally exceed 1,500 ppm. (Woodard-USGS)
W71-05902

DISCUSSION OF THE USES OF ELECTRONIC PLOTTING IN GROUNDWATER ENGINEERING,
Johnson and Anderson, Inc., Pontiac, Mich.
G. E. Evans.
Paper, Johnson and Anderson, Inc, Pontiac, Mich, 1970. 19 p, 12 fig.

Descriptors: Computer programming, Engineering, *Computers, Mapping, Boreholes, Calculations, Logging (Recording), Profiles, Electronic equipment, *Civil engineering, Drawings, Abilities, Accuracy, Ideas, *Computer applications, Cost savings.
Identifiers: Computer-aided design, *Plotters, Time saving, Time sharing, Computer capability.

Computer-plotters and their application to civil engineering problems are discussed. Several examples show how laborious plotting and profiling of civil engineering work is speeded up and accuracy increased by using the computer-plotter. Some general statements are made concerning the use of computer-plotter programs for mapping, contouring, borehole logging, planning and profiling, and geologic sectioning. Experience indicates that good engineering programs are more likely to be written

by excellent engineers with reasonable programming skills, than by excellent programmers with engineering skills. (USBR)
W71-05906

STABILITY OF ROCK SLOPES--GRAPHICAL METHODS,
Coyne et Bellier, Paris (France).
For primary bibliographic entry see Field 02E.
W71-05909

SETTLEMENT PROBLEM ORIENTED COMPUTER LANGUAGE,
Illinois Univ., Chicago; and Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 08D.
W71-05915

COMPUTER METHODS FOR TRANSIENT ANALYSIS OF WATER-TABLE AQUIFERS,
Ohio State Univ., Columbus. Water Resources Center.
For primary bibliographic entry see Field 02F.
W71-05920

A PROGRAMMING MODEL FOR FARM IRRIGATION SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 03F.
W71-05923

OPTIMIZATION TECHNIQUES FOR WATER RESOURCE SYSTEMS,
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 06A.
W71-06062

SIMULATION OF A WATER RESOURCE SYSTEM, FINAL REPORT,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 05G.
W71-06066

INTERBASIN DIVERSION OF WATER: AN ANNOTATED BIBLIOGRAPHY,
Texas Tech Univ., Lubbock. Water Resources Center.
George A. Whetstone.
Water Resources Center Report WRC-71-1, Vol 2, January 1971. 323 p. Supported by Water, Inc and Texas Tech Water Resources Center.

Descriptors: *Bibliographies, *Inter-basin transfers, *Water resources development, Water supply, Water transfer, Diversion.

Future growth in the state of Texas will depend upon inter-basin water transfers into the state from other regions. This leads to a realization of the need for accumulating all inter-basin transfer literature into a central publication. This volume contains 1027 abstracts in a chronological arrangement (1855-1970) and extends and augments Vol. 1 (abstracted in this publication, W70-06816). The abstracting and indexing formats are identical, with author and geographic indexes. Every effort was made to prevent duplication in subject matter. Papers involving certain large-scale projects were not abstracted unless they contain new information. A third volume is in preparation. (See also W70-06816) (Casey-Arizona)
W71-06071

EXTRAPOLATION OF HISTORICAL STORM DATA FOR ESTIMATING DESIGN-WAVE HEIGHTS,
Chevron Oil Field Research Co., La Habra, Calif.
C. Petrauskas, and P. M. Aagaard.
Society of Petroleum Engineers Journal, Vol 11, No 1, p 23-37, March 1971. 15 p, 17 fig, 4 tab, 9 ref, 2 append.

Descriptors: *Waves (Water), *Design storm, *Synthetic hydrology, Offshore platforms, Weather forecasting, Probability.
Identifiers: Wave height forecasting.

An improved method is presented for selecting offshore structure design waves by extrapolating historical storm data to obtain extreme value statistics. The method permits flexibility in choice of distribution functions through use of computerized procedures, estimates extrapolated wave-height uncertainty due to small sample size, and includes criteria for judging whether or not given wave-height values can be represented by one or more of the distributions implemented in the method. The relevance of uncertainty to selection of design-wave heights is discussed and illustrated. (Knapp-USGS)
W71-06123

FLOODS FROM SMALL DRAINAGE AREAS IN CALIFORNIA-A COMPILATION OF PEAK DATA OCTOBER 1958 TO SEPTEMBER 1969,
Geological Survey, Menlo Park, Calif., Water Resources Div.
Arvi O. Waananen.
Geological Survey Data Compilation Report, July 9, 1970. 146 p, 46 fig, 1 tab.

Descriptors: *Floods, *Small watersheds, *California, Data collections, Hydrologic data, Stream gages, Gaging stations, Stage-discharge relations, Surface waters, Discharge measurement, Hydrographs, Rain gages.
Identifiers: Flood data (Calif).

An investigation of the magnitude and frequency of floods from California drainage areas generally of less than about 10 square miles was begun by the Geological Survey July 1, 1958. The objective of the program is to obtain sufficient basic hydrologic data to define for such areas the magnitude and frequency of floods on a regional basis for the entire State, and to obtain sufficient flood-hydrograph data, on a statewide basis, for detailed hydrologic study. The report consists of a tabulation of the annual peak stage and discharge, by water years, for each gaging station in the program. The discharge hydrograph and recorded graph of accumulated rainfall for significant peak discharges during the current year are included for stations that are equipped with water-stage recorders. Monthly and annual rainfall totals are given for the recording stations. In addition, discharge hydrographs and precipitation graphs, as well as monthly and annual precipitation, published in previous annual reports, are repeated in this report to provide a complete record. Program activities during the current year and program plans for the following year are summarized briefly. (Woodard-USGS)
W71-06127

WESTERN SNOW CONFERENCE.
For primary bibliographic entry see Field 02C.
W71-06133

USING ALL AVAILABLE HYDROLOGIC DATA,
British Columbia Water Resources Service, Vancouver; and British Columbia Univ., Vancouver. Dept. of Civil Engineering.
W. Obedkoff, and S. O. Russell.
Proceedings 38th Annual Meeting of Western Snow Conference, April 21-23, 1970, Victoria, British Columbia, Canada: Printed by Colorado State Univ, Fort Collins, p 31-36, 1970. 6 p, 1 fig, 2 tab, 7 ref.

Descriptors: *Data collections, *Data processing, *Runoff forecasting, *Hydrologic data, Snow surveys, Networks, Watersheds (Basins), Meteorological data.
Identifiers: *British Columbia.

An approach to the use of both meteorological and streamflow data was developed and applied in Labrador. In this method, a river basin is divided into a number of squares, physiographic parameters are determined for each square, meteorological data are correlated with these parameters and from the resulting equation estimates are made of precipitation, evaporation and runoff for each square. Accumulated runoff is compared with measured runoff. This paper describes an attempt to apply the method to a mountainous area in the interior of British Columbia to determine the areal variation in runoff and also to extend the method by using snow course data as well as meteorological and stream gage data. The results are promising and the technique has important implications for data network design. (See also W71-06133) (Knapp-USGS)
W71-06138

DEVELOPMENT OF SNOW LOAD DESIGN DATA FOR THE UNITED STATES,
Environmental Data Service, Silver Spring, Md.
For primary bibliographic entry see Field 02C.
W71-06141

AN APPROACH TO SNOW LOAD EVALUATION,
John Webster Brown, Inc., Reno, Nev.
For primary bibliographic entry see Field 02C.
W71-06142

SNOW COURSE WEIGHTING PROCEDURE,
British Columbia Water Resources Service, Vancouver. Hydrology Div.
C. H. Coulson.
Proceedings 38th Annual Meeting of Western Snow Conference, April 21-23, 1970, Victoria, British Columbia, Canada: Printed by Colorado State Univ, Fort Collins, p 74-81, 1970. 8 p, 5 fig, 1 tab, append.

Descriptors: *Statistical methods, *Regression analysis, *Correlation analysis, *Snow surveys, *Water equivalent, Variability, Runoff forecasting, Sampling.
Identifiers: Snow course data, Data weighting.

This paper describes the derivation and use of a method of combining interdependent variables into a single variable for use in multiple regression analyses. The method is statistical and not directly related to any physical parameters. Use of this method to solve a given problem requires the use of a digital computer with a plotting arm auxiliary. The combination of water equivalents at different snow courses is emphasized but the method could be extended to other independent variables. An example of weighting snow courses for a Columbia River forecast procedure is illustrated. (See also W71-06133) (Knapp-USGS)
W71-06146

GROUNDWATER RESOURCES OF NELSON COUNTY, NORTHEASTERN NORTH DAKOTA,
Geological Survey, Washington, D.C.
Joe S. Downey.
For sale by US Geological Survey, Wash, DC, 20242 - price $1.00. Geological Survey Hydrologic Investigations Atlas HA-428, 1 sheet, 1970. Text, 4 fig, 3 map, 1 tab, 3 ref.

Descriptors: *Water resources development, *Groundwater, *North Dakota, *Hydrogeology, Geology, Aquifer characteristics, Water yield, Water levels, Water wells, Investigations, Water quality, Hydrologic data, Data collections, Chemical analysis, Water resources, Evaluation, Maps, Water level fluctuations, Groundwater movement.
Identifiers: *Groundwater resources (Nelson County, ND), *Hydrologic Atlas.

This investigation is part of a Statewide program in North Dakota to determine the location and extent of the groundwater reservoirs (aquifers); to evaluate the occurrence and movement of groundwater within these aquifers, including the sources of recharge and discharge; and to determine the

hemical quality of the groundwater. Nelson Coun- covers an area of approximately 1,000 square iles in northeastern North Dakota and is almost ntirely covered by glacial drift, which may be sub- ivided into two distinct types. The most common ype, till, was mainly deposited by active glaciers, as a low permeability, and will normally yield only mall quantities of groundwater to wells. Glaciofluial deposits, the least common type, were deposited by moving water, are normally quite ermeable, and form the principal aquifers in Nelon County. The glacial till normally yields water vith greater dissolved solids than water produced rom wells tapping glaciofluvial deposits. This 1- heet Hydrologic Atlas includes a Groundwater Availability map and 7 related tables and illustraions. (Woodard-USGS)
W71-06160

WATER RELATED LAND USE IN THE BEAR RIVER DRAINAGE AREA,
Utah Water Research Lab., Logan.
Frank W. Haws.
Report PR-WG 40-2, Utah Water Research Laboratory, April 1969. 119 maps, 69 tab.

Descriptors: *Hydrologic data, *Utah, *Maps, *Data collections, *Water utilization, Regional analyses.
Identifiers: *Water-related land use, *State water plans, *Bear River.

In developing a state water plan, an important item of consideration is the amount of water depleted from a system by transpiration and evaporation. The many maps of this study classify the different crops, types of natural vegetation, and other water-related land usages, and define the areas occupied by each so that estimates of depletion can be calculated. A field study in 1966 obtained aerial photographs of the area and labeled them, indicating boundaries and types of land use. From these the maps were made. Twenty-nine categories of water-related land use are shown, and each map covers eighteen sections. Each section is also listed in a table, and the number of acres under each kind of land use is listed. This report covers the Bear River Drainage Area of extreme northeastern Utah. (Yensen-Arizona)
W71-06212

WATER RELATED LAND USE IN THE UTAH LAKE DRAINAGE AREA,
Utah Water Research Lab., Logan.
M. Leon Hyatt, Gaylord V. Skogerboe, and Frank W. Haws.
Report PR-WG 40-1, Utah Water Research Laboratory, February 1968. 58 tab, 87 maps, 1 fold map.

Descriptors: *Utah, *Hydrologic data, *Maps, *Water utilization, *Data collections, Regional analyses.
Identifiers: *Water-related land use, *State water plans.

In developing a state water plan, an important item to consider is the amount of water depleted from a hydrologic system by beneficial and non-beneficial vegetation. The maps of this study classify the types of vegetation and water-related land use and define the areas of each so that estimates of depletion can be calculated. Aerial photographs of the area were labeled, indicating boundaries, types of vegetation, and other land use. These were transferred to base maps, along with irrigation systems. Each map covers eighteen sections. Twenty-nine categories of land use are shown on the maps. Each section is listed separately in a table, and the number of acres under each kind of land use is listed. The land use for each county and hydrologic sub-area is also summarized. This report covers the Utah Lake Drainage Area of north-central Utah. (Yensen-Arizona)
W71-06213

HYDROLOGIC INVENTORY OF THE UTAH LAKE DRAINAGE AREA,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 02E.
W71-06218

HYDROLOGIC INVENTORY OF THE UINTAH STUDY UNIT,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 02E.
W71-06219

HYDROLOGIC INVENTORY OF THE WEBER RIVER STUDY UNIT,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 02E.
W71-06220

STATISTICAL SUMMARIES OF NEW JERSEY STREAMFLOW RECORDS,
Geological Survey, Trenton, N.J.
S. L. Laskowski.
New Jersey Division of Water Policy and Supply Water Resources Circular 23, 1970. 264 p, 3 fig, 21 ref.

Descriptors: *Streamflow, *Hydrologic data, *Data collections, *Gaging stations, *New Jersey, Discharge measurement, Surface waters, Flow rates, Low flow, Average flow, Peak discharge, Statistical methods, Duration curves.
Identifiers: Annual flow.

The records for 79 of approximately 110 stream-gaging stations presently or previously operated in New Jersey, plus records for three stations in Pennsylvania, and one in New York are presented in summarized form. A description of the station, three arrangements of data summarizing the daily flow records and one table listing statistics of the monthly mean flows are provided. Plotting positions for the three types of curves describing the characteristics of daily discharge are listed for each station. Statistical parameters are also presented so that alternate curves may be drawn. All stations have 5 or more years of record. The data are based on observed flow past the gaging station. For any station where the observed flow is affected by regulation or diversion, a remarks paragraph, explaining the possible effect on the data, is included in the station description. (Woodard-USGS)
W71-06228

PROBLEM OF FLOOD-CONTROL IN SMALL BASINS,
G. Lombardo.
Giorn Genio Civile (GIGCAO), Vol 106, No 2-3, p 110-115, Feb-Mar 1968.

Descriptors: *Computer programs, *Flood control, *Data storage and retrieval.
Identifiers: *Rainfall analysis.

The study of possible utilization of a computer for control of floods in small basins, with revised methods and procedures for gathering and elaborating hydrological data is examined. The procedure for rapid calculation of a rainfall graph and for obtaining flow regime from rainfall characteristics in absence of analytical relation of hydrology is explained.
W71-06298

DENSE NETWORK FOR RAPID MEASUREMENT OF RAINFALL RATE,
For primary bibliographic entry see Field 02B.
W71-06410

COMPUTERS IN HONG KONG PUBLIC WORKS,
For primary bibliographic entry see Field 05G.
W71-06423

08. ENGINEERING WORKS

8A. Structures

FIELD INVESTIGATION OF ENVIRONMENTAL EFFECTS OF COOLING TOWERS FOR LARGE STEAM ELECTRIC PLANTS,
Portland General Electric Co., Oreg. Dept. of Engineering Design.
For primary bibliographic entry see Field 05D.
W71-05930

PROBLEMS IN DISPOSAL OF WAST HEAT FROM STEAM-ELECTRIC PLANTS.
Federal Power Commission, Washington, D.C. Bureau of Power.

1969. 53 p, 11 fig, 4 tab, 39 ref.

Descriptors: *Thermal pollution, *Thermal powerplants, *Cooling water, *Cooling towers, *Aquatic environment, Environmental engineering, Fish physiology, Fish farming, Electric power demand, Environmental effects, Water temperature, Thermal power, Discharge, Ohio River.
Identifiers: *Waste heat disposal, Steam-electric plants, Heat disposal.

This report, prepared by the staff of the Bureau of Power, was prepared as part of the Commission's updating of the 1964 National Power Survey. The report explains the problems and conventional means of waste heat disposal from both fossil fueled and nuclear steam-electric plants in the conterminous United States. The methods of waste heat disposal discussed include once-through cooling, wet tower, dry tower, and evaporative pond cooling. The effects of thermal discharges on streams and water uses and water quality standards are discussed. The aesthetics and environmental concerns are mentioned. Estimates of power requirements and cooling water requirements, together with potential sources of cooling water supplies, are discussed. The capacity of the Ohio River to supply required water quantities is analyzed. A summary of completed and current studies of waste heat disposal problems is included together with statements regarding specific research needs. Comparative investment costs of cooling water systems are given. About 492 plants will be required by 1990, of which about 255 would be new sites. The total generating capacity requirements will be about 1 million megawatts. The significance of water temperature as it affects the physiology of fish is discussed. (Poertner)
W71-05931

FACTORS IN WASTE HEAT DISPOSAL ASSOCIATED WITH POWER GENERATION,
Federal Power Commission, Washington, D.C.
Robert M. Jimeson, and George G. Adkins.
Paper No 26a prescnted at 68th National Meeting of American Inst of Chemical Engrs, Houston, Feb 28-March 4, 1971. American Institute of Chemical Engineers, New York, 1971. 41 p, 8 fig, 4 tab.

Descriptors: *Thermal powerplants, *Cooling towers, *Environmental effects, *Thermal pollution, *Cooling water, Electric power demand, Water temperature, Thermal power, Environmental engineering, Electric power production, Discharge.
Identifiers: *Waste heat disposal, Steam-electric plants, Heat disposal.

Energy requirements from fossil fueled and nuclear steam generating plants, together with associated waste heat, are projected for the year 1980 and 1990. Ecological effects and beneficial uses of waste heat are stated. The trend in thermal standards for natural water bodies is discussed. The characteristics of various cooling methods for disposing of waste heat at steam-electric powerplants are presented along with their cost and effectiveness. The study concludes that the demand for electric power will increase fourfold by 1990. As

any as 140 and possibly as many as 200 new plants will require cooling towers, and from 50 to 130 new plants may require cooling ponds by the year 1990. The cost to the power industry for control of the water environment is estimated to range from $1.3 to $2 billion per year, and the industry must raise an additional 6 to 9 billion dollars in the capital market in the next twenty years to achieve control of thermal pollution. Much research leading to improved environmental controls is yet needed. Also, additional emphasis should be placed on research leading to more efficient power generation, since successful development would have a major impact on reducing environmental degradation. (Poertner)
W71-05932

MASTER PLAN FOR THE DEVELOPMENT OF WATER DISTRIBUTION FACILITIES FOR GENESEE COUNTY, ENGINEERING REPORT.
Consoer, Townsend and Associates, Flint, Mich.

Genesee County Drain Commissioner, Flint, Michigan, 1969. 96 p, 32 fig, 10 tab. Project No P-Mich-3230; US Dept of Housing and Urban Development.

Descriptors: *Water supply, *Water conveyance, *Water distribution, *Planning, *Water resources development, *Municipal water, Cities, Urbanization, Water delivery, Pumping, Demand, Consumptive use, Hydraulic engineering, Michigan.
Identifiers: *Genesee County, *Flint.

The initial or first phase of the Genesee County water supply system, as proposed in this report, would consist of a pumping station, two 4.0 million gallon capacity standpipes constructed along Vassar Road near Potter Road, trunk distribution mains and a 2.0 million gallon capacity elevated tank located near Grand Blanc and Porter Roads. The water for the County system would be obtained through two 18 inch diameter metered connections to an existing 72 inch main at Vassar Road. The water would flow from the metered connections into two 4.0 million gallon standpipes, from which it would be pumped by the Vassar Road pumping station facilities into the proposed supply system. The first phase of construction would cost an estimated $16,800,000. The second phase would consist of a second pumping station with adjacent 20.0 million gallon ground storage reservoir at Oak and Potter Roads together with additional 36 inch diameter transmission mains. The second phase would cost an estimated $12,600,000. The third phase expansion would include a 20.0 mgd capacity pumping station and 10 million gallon capacity reservoir to be constructed near Elms Road and Stanley Road. This pumping station and related distribution system piping would cost an estimated $5,400,000. The construction and project costs for these three phases of the water system are based upon present-day costs and are related to the present Engineering News-Record Construction Cost Index of 1229. The consultants suggest that project construction costs be financed by the various governmental units served in accordance with estimated benefits. (See also W71-05934) (Poertner)
W71-05933

SNOW LOADS FOR THE DESIGN OF ROOFS IN CANADA,
National Research Council of Canada (Ottawa). Div. of Building Research.
D. A. Lutes.
Proceedings 38th Annual Meeting of Western Snow Conference, April 21-23, 1970, Victoria, British Columbia, Canada: Printed by Colorado State Univ, Fort Collins, p 61-67, 1970. 7 p, 5 fig, 6 ref.

Descriptors: *Snowpacks, *Density, *Loads (Forces), Ice loads, Load distribution, Weight, Design, Design criteria, Building codes, Snow surveys, Data collections, Sampling, Topography, Altitude.
Identifiers: *Snow loads, *Canada.

A more rational approach to snow loads for the design of roofs in the National Building Code of Canada has resulted from a ten-year country-wide survey of actual snow loads on roofs. The objective of the survey was twofold: to determine by how much average roof loads can be reduced below the level of ground loads; and to assess factors that result in the accumulation of higher loads on particular areas of various shapes of roofs from the effects of wind, sliding, etc. This paper describes the factors that affect snow loads, the survey and its results, and the present requirements for snow loads for the design of roofs in Canada. (See also W71-06133) (Knapp-USGS)
W71-06143

CONTROL OF INFILTRATION IN SEWER SYSTEMS-DESIGN AND MAINTENANCE,
Nashville Metropolitan Government and Davidson County, Tenn. Sewerage Services.
For primary bibliographic entry see Field 05D.
W71-06197

INSTALLATION OF SOIL, WASTE AND DRAINAGE PIPING IN FILL OR UNSTABLE SOIL,
T. Cecil Brown.
Water Sewage Works -- Reference Number, p R-47 to R-50, Nov. 28, 1969.

Descriptors: *Installation, *Sewers, *Drainage engineering, *Costs, Subsurface runoff, Infiltration.

Drainage lines, which can be sanitary, storm or combined sewers, should be well designed and constructed, properly supervised during construction, and closely inspected. Recommendations are made in this article to facilitate compliance with these objectives. Sewer installation is described in terms of considerations to be made regarding the filled area. Cost criteria are also discussed. Economy is not always limited to the selection of the least expensive materials because cheaper material may prove to be the most expensive to the taxpayer in the long run. Infiltration and joint failure are treated briefly with recommendations for tight joints and for the prevention of stormwater entrance into sanitary sewers.
W71-06285

A GUIDE FOR CONTRACTORS ON THE CONSTRUCTION OF DRAINAGE SYSTEMS,
A. Dreschsel.
Ber Abwassertech Ver (BABVAD), No 17, p 123-131, 1964.

Descriptors: *Hydrogeology, *Drainage patterns (Geologic), *Drainage engineering.
Identifiers: *Drain pipes, Storm sewers.

The author stresses the importance of preliminary hydrogeological investigations and studies on flow conditions of the area where a drainage system is to be installed. He then deals with the design, construction, materials, and equipment which should be used where drain pipes are required for ordinary drainage systems and/or storm-sewage systems.
W71-06288

ANGLESEY ALUMINUM SEA OUTFALL,
Bruce Dubleton.
Surveyor, Vol 85, No 4049, p 22-25, Jan 16, 1970. 5 fig.

Descriptors: *Outlets, *Methodology, *Aluminum, *Construction materials, *Construction.
Identifiers: *Great Britain.

Decisions and procedures involved in constructing an aluminum sea outfall extension are reviewed. Methods employed for determining the following factors are discussed: length of the extension, material selection, the method of support, construction and launching procedures. Although extension of the outfall presented many constructional problems, its costs was less than for an alternate scheme involving sewage treatment. A s
nificant feature of the construction process w
that work took place from a ten-man inflatab
craft with heavy materials towed into position usi
buoyancy tanks.
W71-06289

**LOW-PRESSURE AIR TESTS FOR SEWE
LINES,**
W. J. Malcolm.
Am City, Vol 84, No 11, p 74-75, Nov 1969. 2 dia

Descriptors: *Testing, *Sewers, *Infiltratio
Leakage.
Identifiers: *Sewer lines, *Air-testing.

New waste water lines can be tested for leakage
exfiltration either by the common method of wat
pressure or by low-pressure air, a method becom
ing more popular. Such testing is imperative since
there is no exfiltration, neither will there be infiltrt
tion. A tight sewer line lowers the volume flowin
into lines and treatment plants, thus, pumping an
treatment costs are lowered, and less flooding oc
curs. The author presents eight frequently-aske
questions concerning air testing, and he answe
the questions briefly.
W71-06299

**FLOOD CONTROL DESIGN UTILIZES LARG
ELLIPTICAL PIPE,**
Alfred R. Pagan.
Public Works, Vol 100, No 12, p 87-88, Dec 1969

Descriptors: *Pipes, Installation, Design, Overflow
New Jersey.
Identifiers: *Elliptical pipes.

The use of 72- by 113-inch elliptical reinforce
concrete pipes in checking overflows in Wood
bridge, New Jersey is discussed. A number of spe
cial fittings were designed which included acces
structures, connections, and horizontal storm drai
deflection sections. Cylinder tests and installmen
difficulties are mentioned.
W71-06302

**WASHED-OUT PLATE CULVERT RESET IN
17-TON SECTIONS BY CRANE.**

Construct Methods Equip, Vol 50, No 7, p 54-57
Jul 1968. 6 fig.

Descriptors: *Flood damage, *Culverts, *Cranes
*Repairing, *Construction, *Installation.

When a 500-foot length of culvert comprised ot
600 plate sections was washed out by a flash flood
the contractor unbolted the conduit in 36-foot bar-
rels instead of dismantling the pipe plate by plate
and lifted the sections out by crane. The sections
were stored on the bank to be reset after the bed
dried and was restored. A simple wooden screened
shaped the concrete sand bed for the 21-foot
diameter culvert. Details of the construction and
installation procedures are included.
W71-06336

**WORK STARTS ON 11-MILE INTERCEPTOR
TO SOLVE TORONTO'S SEWER PROBLEM.**
Eng Contract Record, Vol 83, No 6, p 68-69, Jun
1970. 2 diag.

Descriptors: *Construction, *Contracts, *Interception, *Design, *Sewers.
Identifiers: *Canada, *Interceptor sewer, Toronto.

In metropolitan Toronto an interceptor to relieve
existing high- and low-level interceptor sewers,
which are inadequate for the area they cover, is
under construction. S. McNally and Sons Ltd. was
among a number of bidders, and it was awarded all
portions of the project. The project entails the con-
struction of a 61,640 foot-long shaft varying in
diameter from 60 to 120 inches spanning the city

from east to west. The estimated time of construction is three years. Information on the operation and techniques used is included.
W71-06337

STORMWATER SEWER DESIGN IN METRIC.

Inst Munic Engrs, Vol 97, No 5, supplement no 4, May 1970.

Descriptors: Measurement, *Design.
Identifiers: Metric system, Conversions charts, *Storm sewers.

First impressions of the use of metric units in stormwater sewer design are expressed. In using the metric system, awkward multipliers are removed. Conversion charts are listed.
W71-06342

DESIGN EXAMPLES IN METRIC.

J Inst Munic Engrs, Vol 97, No 2, supplement no 2A, Feb 1970.

Descriptors: Measurement, Design.
Identifiers: *Combined sewers, Metric system.

A metric example of the combined sewer and small pumping station is worked out using the rational formula and the Ministry of Health figures for intensities of rainfall.
W71-06343

REMOTE-CONTROL 'MINI-DAMS' GUARD MINNEAPOLIS SEWERS.

Munic Eng, London, Vol 146, p 358, 1969.

Descriptors: *Construction materials, Overflow, Outlets, Water pollution control, Mississippi River.
Identifiers: *Minneapolis-St. Paul, Rubber storage containers, Storm sewage.

A description is given of the installation of inflatable bags of rubberized fabric at the outlet points of the storm-sewage overflows serving Minneapolis and St. Paul, Minn. The bags, which were installed to reduce pollution of the Mississippi River during storms, can be inflated by remote control to provide dams varying in height, thereby at any time diverting as much storm sewage into the interceptor sewers as the treatment works can accept.
W71-06345

ISLAND CITY SOLVES TOUGH SEWERAGE PROBLEM.

Public Works, Vol 101, No 2, p 95, Feb 1970.

Descriptors: *Sewers, *Steel pipes, *Design, Construction costs, Construction equipment, Infiltration.
Identifiers: *Galveston, Texas, *Truss pipe.

By using Armco Steel Corporation's double-walled Truss pipe, a groundwater infiltration problem was eliminated from Galveston's sewer system. The Truss pipe can also be easily tapped for house connections, and its low infiltration specifications make possible an economical design for factory-built treatment plants. Construction costs for such plants are included, as well as dimensions of the extra-strength piping.
W71-06346

CONSTRUCTION COST REQUIREMENTS FOR WATER AND WASTE WATER FACILITIES.
For primary bibliographic entry see Field 05D.
W71-06347

INTERNATIONAL BUILDING EXHIBITION - OLYMPIA LONDON 13-25 NOVEMBER 1969.

Surveyor, Vol 84, No 4039, p 54, 74, 77, Nov 7, 1969. 3 fig.

Descriptors: *Plastic pipes, *Rain gages, *Design criteria, *Construction materials, *Underground structures, Flow rates, Drainage systems, Equipment, Plastics.
Identifiers: *Great Britain.

This article reviews exhibitions of products, equipment, materials, and techniques at the International Building Exhibition at Olympia, London. A new square-line instead of round rainwater gutter system of plastic was displayed, in addition to a squareflow rainwater gage. Both have greater flow capacity than their traditional counterparts. A new drainage system exhibited has the following features: simplicity of layout and specification, push jointing of pipes, fittings, and plumbing connections, and fast laying speed. A domestic underground stormwater drain using plastic Polydrain PVC pipe was demonstrated; this material is now being employed extensively for underground drainage systems.
W71-06348

SUSPENDED SEWAGE PIPELINE.

Water Waste Treat, Vol 12, No 8, p 256, Jul/Aug 1969.

Descriptors: *Construction equipment, *Installation, *Pipelines.
Identifiers: *Great Britain, *Suspended pipeline.

By the use of Hepworth-Polva pvc pipe with flexible couplings, a 12-inch diameter sewage pumping main has been suspended from a bridge (which crosses the River Tay) on fabricated metal brackets which allow for pipe movement arising from thermal expansion and contraction of the pipeline. The method of suspension allows for leveling, and the completed pipeline has an insulating wrapping. The installation also has advantages over traditional materials in that the pipeline is light in weight, immune to corrosion, and requires no maintenance.
W71-06356

STORM OVERFLOWS AND STORM SEWAGE,
For primary bibliographic entry see Field 05G.
W71-06367

DRAINAGE OF WIDE ROAD PAVEMENTS,
K. W. Dobinson.
Inst Engrs (Australia), Vol CE 10, No 1, p 1-6, Apr 1968.

Descriptors: Surface drainage, Design, Drainage engineering, Drainage systems.

The effectiveness of various types of pavement drainage structures is discussed. The surface drainage design method, used under certain conditions, is described. A graphic system for the design of pavement drainage is examined.
W71-06368

MORE THAN JUST A BUILDING,
L. C. Dubs.
Am City, Vol 85, No 6, p 119-124, June 1970.

Descriptors: *Drainage systems, Construction, Overflow, Ohio.
Identifiers: *Dry wells.

A three-phase program designed to place all the city's service functions in one area is underway in Canton, Ohio. The first phase involves the construction of two buildings; one a motor vehicle service center, and the other a street and sewer department. The service center's unusual drainage system consists of a system of dry wells constructed throughout the area with one large dry well absorbing overflow from the smaller ones. This system was adopted because storm sewers were not available in the region. Only minor flooding occurred once when there was a heavy rainfall, so the effectiveness of this system was evidenced.
W71-06369

A NEW TWIST (90 DEGREES IN FACT) TO SEGMENTED SEWER - PIPE DESIGN.

Eng Contract Record, Vol 83, No 6, p 56-57, Jun 1970.

Descriptors: *Sewers, *Design, *Estimated costs, Installation.
Identifiers: *Canada, *Sewer hydraulics.

The City of Edmonton, Canada, is using a new segmented pipe on the sewer line in the downtown area. Chief design engineer F. Bereczky thought of tilting a horizontal sewer line to a 90 degree position, thus changing the flow characteristics. The design of the pipe has been worked out so that all dimensions are a function of the inside diameter, and the design can be adopted to any size of pipe. The installation procedure and the estimated cost of the new line are given.
W71-06376

WATER STORAGE METHODS -- FROM CUPPED HANDS TO COMPUTERS,
T. W. Lumsden.
Water Pollution Control, Vol 107, No 6, p 16-19, and 30, Jun 1969.

Descriptors: *Reservoir storage, Construction costs, Storm drains, Storm runoff.
Identifiers: *Stormwater systems.

Storage tanks and reservoirs should provide for flow equalizing, fire protection, and emergencies. An overall system analysis is usually necessary to determine the most economical combination of storage facility, trunk mains, and pumping facility. Criteria for locations of storage facilities and construction cost considerations are noted in this article. Stormwater systems exhaust sizable segments of expenditures utilized for water storage in general. Drains must provide for normal stormwater runoff and higher flows resulting from reservoir emptying and inadvertent overflows.
W71-06385

SOLUTION OF AN UNUSUAL SUBSURFACE DRAINAGE PROBLEM,
E. W. Brand.
J Irrigation Drainage Div, Am Soc Civil Engrs, Vol 94, No IR2, p 199-221, Jun 1968.

Descriptors: *Subsurface drains, *Surface-groundwater relationships, Design, Storm runoff.
Identifiers: *Surface runoff, Groundwater, Belgium.

The stages followed in designing a subsurface drainage system for the inner-ring road being built in Antwerp, Belgium are described. The system will collect and carry away surface runoff, will permanently lower the groundwater table, and will collect and carry away seepage water resulting from this lowering. Conventional methods were adopted for stormwater drainage design. The seepage water and stormwater collected in a catch basin will run by gravity in pipes to one of four low points in the road's vertical profile. From two of these points the water will flow to pumping stations and from the other two, into rivers. The most complicating factor in the subsurface drainage design was the possible effect of the precipitation of ferric oxide from groundwater. This factor necessitated complete submergence of the intake system. Factors influencing the final selection of the subsurface drainage system are explored in detail.
W71-06392

STUDIES ON THE CHEMICAL CONTROL OF TREE ROOTS IN SEWER LINES,
For primary bibliographic entry see Field 04A.
W71-06397

INFILTRATION IN SEWERS,
W. J. Robertson, and A. W. Bird.
Australian Civil Eng, Vol 10, No 4, p 44-47, Apr 1969.

Descriptors: *Investigations, *Infiltration, Sewers.
Identifiers: *Australia.

Extensive investigations carried out by the Melbourne and the Metropolitan Board of Works, where the problem of entry of extraneous water into the sewerage system was studied, is discussed. Factors affecting wet weather infiltration are enumerated.
W71-06403

SOME THOUGHTS ON SEWER PIPE BEDDING,
William J. Warwick.
Water Pollution Control, Vol 107, No 8, p 30-31, Aug 1969.

Descriptors: *Pipelines, Design criteria, Installation.
Identifiers: *Sewer pipe bedding.

Important aspects of sewer pipe bedding are explored in the areas of: satisfactory bedding needs, economics of installation, special cases, enforcement of design criteria, and performance. Technical information is lacking concerning the special case of common or separate trenches for side-by-side storm and sanitary sewers or sewer connections. Usually two such pipes are laid in a common trench, but the economics and functional usages may not always warrant this choice. More study is needed to determine the advantages or disadvantages of dual trenches.
W71-06412

NEW IDEAS FOR CALCULATING STORM WATER OVERFLOW SETTINGS AND THE DESIGN OF STORM WATER TANKS.

Civil Eng Public Works Rev, Vol 65, No 766, p 487, May 1970.

Descriptors: *Storm runoff, *Overflow, *Design.
Identifiers: *Storm overflows, Storm tank.

The Technical Committee on Storm Overflows devised a new formula for setting storm overflows which enables them to be designed without first conducting infiltration surveys. The report of this committee also condemns the use of low-side weir storm overflows because they cause excessive pollution. Ideas for the use of storm tanks during periods when they are not required for their design purposes are proposed. The question of flow standard storm tank effluent discharged at the same time as high-quality standard effluent is presented but not answered in this report.
W71-06416

STORM OVERFLOWS AND THE DISPOSAL OF STORM SEWAGE.

Effluent Water Treat, Vol 10, No 3, p 154-155, Mar 1970.

Descriptors: *Storm runoff, *Sewage, Design, Screens, Overflow.
Identifiers: Storm tank, Storm sewage, Great Britain.

Comments on the final report of the technical committee concerned with storm overflows and the disposal of storm sewage, are discussed. It is the first known official document containing recommendations on the settling of storm overflows and on the bases of storm tank design. The main conclusions and recommendations of this British report are listed.
W71-06417

MAIN DRAINAGE,
T. A. Anderson.
Surveyor, Vol 83, No 4010, p 92-94, Apr 18, 1969. 6 fig.

Descriptors: *Sewers, *Construction, Tunneling, Geomorphology, Installation, Legal aspects.
Identifiers: *Construction problems, *Sewer construction, *Scotland.

The author describes several sewer jobs he undertook as a Resident Engineer in the Glasgow Office of Public Works. One job entailed the construction of a two-mile main duplicate sewer in Rutherglen. Problems arising due to encounters with varying types of ground are related and measures taken explained. As a result of high pressure, escapes of air (blow-outs) occurred on a nearby railway line. Tunneling was halted until a tunnel shield was installed which helped complete the job. Other construction problems relating to sewer jobs are discussed. Interference with Glasgow parking areas due to sewer construction was solved through the institution of a program of conversion of open spaces to off-street car parks. In conclusion, the author recommends the establishment of regional sewerage authorities similar in organization to Scotland's Water Board, plus the formation of drainage boundaries on a topographical rather than a parochial basis.
W71-06422

8B. Hydraulics

FLAT-VEE WEIRS IN ALLUVIAL CHANNELS,
Hydraulics Research Station, Wallingford (England).
William Rodney White.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY3, Paper 7989, p 395-408, March 1971. 14 p, 11 fig, 2 ref.

Descriptors: *Weirs, *Alluvial channels, *Channel morphology, *Stage-discharge relations, *Hydraulic models, Model studies, Sediment transport, Hydraulic similitude, Sedimentary structures, Bed load, Alluvium, Gaging stations, Stream gages.
Identifiers: Flat-vee weirs.

Sediment tests were carried out with the ultimate aim of providing design data for flat-vee weir installations in alluvial channels. The model study was of an idealized nature but did serve to indicate those variables which are important and the type of conditions where shoaling in the approach channel is likely to occur. Correlation with initial movement theory was established and the results were used to predict prototype bed formations in terms of sediment properties and flow conditions. The mean angle at which the water surface line contracted was one on three. The breadth of channel between the side shoals immediately upstream of the weir crest line was, in each case, 1.1 m while the water surface breadth at the crest was approximately 1.0 m. This means that near the crest line the shoals extended into the river almost to the point where water was just spilling over the crest line. (Knapp-USGS)
W71-05849

EFFICIENCY OF HYDRAULIC JUMP,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
Satya P. Garg, and Hari R. Sharma.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY3, Paper 7994, p 409-420, March 1971. 12 p, 6 fig, 3 tab, 11 ref.

Descriptors: *Hydraulic jump, *Stilling basins, *Energy dissipation, Head loss, Hydraulic structures, Flow, Open channel flow, Hydraulics, Critical flow, Drops (Structures), Froude number.
Identifiers: Efficiency (Hydraulic jump).

The existing definitions of the efficiency of hydraulic jump may not furnish a correct picture of the physical phenomenon. A more rational definition of the efficiency of hydraulic jump on a horizontal floor in a rectangular channel is given by the ratio of the energy actually dissipated in the jump to that required to be dissipated. The jump efficiency increases rapidly with increasing Froude number and it becomes asymptotic to the 100% line at a Froude number of about 4. The scouring energy of the flow downstream of the jump also decreases with increasing Froude number. Experimental data have been presented which show that scour below hydraulic structures provided with jump-type stilling basins in which the Froude number of the incoming flow is less than 4.5 can be reduced considerably by the provision of floor blocks. (Knapp-USGS)
W71-05850

ON UNIFORM FLOW THROUGH SMOOTH RECTANGULAR OPEN CHANNELS,
Connecticut Univ., Storrs. Dept. of Agricultural Engineering.
N. Narayana Pillai.
Text also in French. Journal of Hydraulic Research, Vol 8, No 4, p 403-418, 1970. 16 p, 4 fig, 1 tab, 16 ref.

Descriptors: *Open channel flow, *Channel morphology, *Pipe flow, *Closed conduit flow, Uniform flow, Steady flow, Hydraulic gradient, Roughness (Hydraulic), Hydraulics, Flumes, Canals.
Identifiers: Karman-Prandtl equation.

The deviation of experimental data on smooth rectangular channels from the smooth pipe diagram, (Karman-Prandtl equation) which is often recommended for use with an equivalent pipe diameter of 4R, is shown to be mainly due to the effect of shape. A function is defined to take care of the effect of shape. Hydraulic radius has been shown to be a very useful parameter in open channel flow hydraulics. But to reflect the shape effect another linear parameter was required. The wetted perimeter was used in this analysis. (Knapp-USGS)
W71-05863

THE GENERATION OF LANGMUIR CIRCULATIONS BY THE EDDY PRESSURE OF SURFACE WAVES,
Maryland Univ., College Park. Inst. for Fluid Dynamics and Applied Mathematics; and Maryland Univ., College Park. Graduate Meteorology Program.
For primary bibliographic entry see Field 02H.
W71-05871

DIFFUSION FROM A CONTINUOUS SOURCE IN A UNIFORM SHEAR FLOW,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 05B.
W71-05872

HORIZONTAL TRANSPORT IN A ROTATING BASIN OF PARABOLIC DEPTH PROFILE,
Northwestern Univ., Evanston, Ill.
For primary bibliographic entry see Field 02E.
W71-05903

WIND-DRIVEN CURRENTS IN A LONG ROTATING CHANNEL,
Northwestern Univ., Evanston, Ill. Technological Inst.
For primary bibliographic entry see Field 02E.
W71-05904

RESONANCE IN PRESSURIZED PIPING SYSTEMS,
International Power and Engineering Consultants, Ltd., Vancouver (British Columbia).

M. H. Chaudhry.
Proc Amer Soc Civ Eng, J Hydraul Div, Vol 96, No HY9, p 1819-1839, Sept 1970. 21 p, 12 fig, 1 tab, 22 ref, 2 append.

Descriptors: Closed conduits, *Hydraulics, *Fluid mechanics, Valves, Frequency, Matrix algebra, *Pipelines, *Resonance, Pressure head, Orifices, Fluctuation, Water hammer, Fourier analysis, Pumped storage, Water supply systems, *Water distribution (Applied), Harmonics, Bibliographies, Boundary conditions.
Identifiers: *Oscillatory fluid flow.

A new approach based on the transfer matrix method used in the theory of vibrations is presented to study steady-oscillatory flows, and to determine resonating characteristics of pressure conduits. By linearizing the friction loss term, considering the system as distributed, and assuming discharge and pressure head fluctuations as sinusoidal, field matrices for simple pipelines and parallel systems are derived. Point matrices for orifices and for oscillating valves having sinusoidal valve movement are obtained by linearizing the gate equation. Point transfer matrices for branch systems with the side branch having different boundary conditions are also developed. A procedure is outlined to determine the resonant frequencies of system types commonly used in waterpower development and water supply schemes. Validity of the method is demonstrated by comparing results with experimental values and with values obtained by the method of characteristics. (USBR)
W71-05905

REPORT ON TRAPEZOIDAL FLUME MODEL.
Los Angeles County Flood Control District, Calif.

Prepared for US Forest Service, Pacific Southwest Forest and Range Experiment Station. March 1963. 29 p, 19 fig.

Descriptors: *Model studies, *Demonstration watersheds, *Forest fires, *Debris avalanches, *Surface runoff, *Flumes, Canyons, Forest management, Hydraulic models, Hydraulic engineering, Froude number, California.
Identifiers: *Los Angeles, Trapezoidal flumes.

Following the San Dimas Canyon (Johnstone Peak) Fire of 1960, the United States Forest Service established a comprehensive research project with the Experimental Forest, one phase of which was to obtain and evaluate hydrologic data relative to runoff and debris movement from burned watersheds. A preliminary step undertaken in this aspect of the research project was the construction and installation of 36 flumes of trapezoidal section in selected watersheds ranging between 2 and 101 acres in size. On the basis of observations made during storm runoff periods and analysis of hydrologic data obtained during the 1961-1962 storm season, the Forest Service concluded that hydraulic model tests of field installations should be undertaken. In view of the value of hydrologic data from recently burned watersheds, the Los Angeles County Flood Control District joined with the Forest Service in conducting model flume tests. The report describes the model study and presents rating curves to relate flow rate and stage recorded by water level recorders. These rating curves are intended for general application to all flumes where velocity immediately upstream from the inlet is less than critical velocity in the flume, and where the flume, is free from effects from downstream flow stage, but are considered only indicative where flow contains appreciable debris quantities. In addition, criteria are presented for modification of flume installations to effect a control at flume inlets where such control does not already exist. (Poertner).
W71-05929

ONE-DIMENSIONAL OPEN CHANNEL HEAT DISPERSION,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 05G.
W71-06085

CANAL CAPACITY STUDIES MAIN CANAL COLUMBIA BASIN PROJECT,
Bureau of Reclamation, Denver, Colo. Office of Chief Engineer.
For primary bibliographic entry see Field 04A.
W71-06109

TURBULENT DISPERSION IN POROUS MATERIALS AS MODELED BY A MIXING CELL WITH STAGNANT ZONE,
California State Coll., Long Beach; and California Univ., Los Angeles.
For primary bibliographic entry see Field 02F.
W71-06122

EXTRAPOLATION OF HISTORICAL STORM DATA FOR ESTIMATING DESIGN-WAVE HEIGHTS,
Chevron Oil Field Research Co., La Habra, Calif.
For primary bibliographic entry see Field 07C.
W71-06123

PENETRATION IN A GRADED FILTER,
Missouri Univ., Rolla. Dept. of Civil Engineering.
William Chuan Shen.
M. Sc. Thesis, 1970. 91 p, 2 fig, 6 tab, 8 ref, append. OWRR Project A-028-MO (1).

Descriptors: *Filters, *Filtration, *Porous media, Sands, Seepage, Percolation, Hydraulic radius, Porosity, Pores, Interstices, Voids, Deposition (Sediments), Erosion control, Water level fuctuations.
Identifiers: *Filter clogging, *Graded filter beds.

An experimental laboratory study was conducted to examine clogging within and penetration of fines into a single layer graded filter. Hydraulic gradient, filter gradation and flow direction were varied. Forty one tests gave over 600 penetration depths. The magnitude of penetration in filters with considerable variation in gradation patterns correlated with an average hydraulic radius based on the volume of voids and an approximated total surface area. An increased thickness of poorly graded filter will stop penetration such as that caused by seepage erosion. A relationship between hydraulic radius, penetration depth and probability of penetration is presented. (Knapp-USGS)
W71-06151

THE MATTHES ROLLING DIAMETER AS AN INDICATOR OF CHANNEL STABILITY,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 02J.
W71-06169

HYDRAULIC OVERLOADING-FACT OR FICTION,
Resource Consultants, Inc., Nashville, Tenn.
For primary bibliographic entry see Field 05D.
W71-06198

SOME FACTORS TO BE CONSIDERED IN THE DESIGN OF WASTE DISPOSAL WELLS,
Geological Survey, Nashville, Tenn., Water Resources Div.
For primary bibliographic entry see Field 05D.
W71-06199

THE MECHANISM OF DIRECT RUNOFF FROM RAINFALL,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02G.
W71-06264

THE LE ACOUSTIC FLOWMETER - AN APPLICATION TO DISCHARGE MEASUREMENT,
C. R. Hastings.
J Water Works Assoc, Vol 84, No 2, p 127-151, Jun 1970.

Descriptors: *Flowmeters, *Discharge measurement, *Hydraulics, *Instrumentation, Testing.

A variety of discharge measurement devices have been invented of which a flow measuring system using the LE Flowmeter is the most recent system to substantially advance the art. The concept employed is an application of numerical integration by Gaussian Quadrature. Test results under varying conditions of fully developed and distorted flow show that this measurement system has an rms accuracy better than 1.0 percent. Use of the LE Acoustic Flowmeter give this flow measuring system features not possessed by other devices, such as linearity, bidirectionality, no head loss, and not need for calibration.
W71-06293

CHARACTERIZATION AND CONTROL OF COMBINED SEWER OVERFLOWS, SAN FRANCISCO,
D. W. Eckhoff, A. O. Friedland, and H. F. Ludwig.
Water Res, Vol 3, No 7, p 531-543, 1969.

Descriptors: *Overflow, Outlets, *Analytical techniques, Runoff, Sewage treatment.
Identifiers: *San Francisco, *Storm sewage.

In order to find methods for controlling or treating storm-sewage overflows from combined systems in urban areas, overflows from the combined sewerage system of San Francisco were measured and sampled for analysis at two outfalls in the city. The dry-weather flows were also monitored. From the data obtained and other observations, the annual runoff for the whole of the city was compared with its total annual discharge of treated sewage effluent, and the effects of the dry-weather flow on the overflow and of the overflow on receiving waters were investigated. The latter effect produced a considerable increase in the numbers of coliform bacteria which remained higher than normal for about two weeks. The studies showed that treatment of overflows from combined systems could result in a substantial reduction of pollution at less expense than would be involved in separating the systems, and that dissolved - air flotation with chlorination appeared to be a promising method.
W71-06326

SYMPOSIUM ON STORM SEWAGE OVERFLOWS.
For primary bibliographic entry see Field 05G.
W71-06363

CRITICAL OBSERVATIONS FOR HYDRAULIC MEASUREMENTS OF FIXED STORM-SEWAGE OVERFLOWS,
For primary bibliographic entry see Field 05G.
W71-06372

OVERFLOW STUDIES AT A SEWER SYSTEM OF A METROPOLITAN CITY,
Wilhelm v.d. Emde, and Siegfried Hoffman.
Gas Wasserfach (GAWFAN), Vol 110, No 12, p 321-325, Mar 1969. 4 ref.

Descriptors: *Sewers, *Measurement, *Storm runoff, *Overflow, *Parametric hydrology, *Rainfall, *Mathematical studies.
Identifiers: *Capacity, *Germany.

For determining the capacity of the sewer system including stormwater drainage in Hamburg, the flow speed, the water level, and the sludge deposition during dry weather were measured. The speed is found to be approximately 0.5m/sec, and sludge deposition is hardly avoidable at the low inclination of the canal system. The conditions during rainy weather were determined with automatic level recording units. From these level measurements the frequency of overflow in days/year, the overflow duration in hours/year, and the overflow quantity/year were calculated. From the recordings of rainfall and the level measurements at the overflow

spills of the sewer system a diagram is drawn according to Kuipers' equation providing information on the storage capacity and discharge capacity of the overflow spills. These two parameters determine the critical rainfall for the overflow spill. Its magnitude decreases with increasing duration of rain and asymptotically approaches the discharge capacity. To avoid frequent overflow, calculations should be based on the critical rainfall as a function of the overflow time. Since this is not practical, it is recommended to use the normal rainfall for the calculation and multiply the quantities obtained by a constant factor.
W71-06373

METHOD OF AND MEANS FOR DEALING WITH STORM-WATER OVERFLOWS IN SEWERS AND LIKE DRAINAGE SYSTEMS,
F. Wood.
Brit Patent 1,023,311.

Descriptors: *Overflow, *Drainage systems, *Bays, *Treatment facilities, Sewerage, Screens, Outlets.
Identifiers: *Storm sewage, *Storm overflows.

The equipment examined for dealing with storm-sewage overflows in sewerage and other drainage systems comprises a bay fitted with a trough or channel which has walls of unequal height and a mouth covered with a filter screen, which can be cleaned by a rake or rakes rotating in the direction of flow of water through the bay. Under normal conditions of flow, water passes through the bay directly to the sewer, but under storm conditions, the increased flow causes a build-up of pressure in the bay so that water and floating trash flows over the lower wall of the trough and through the screen to the storm-sewage outlet. Trash is swept from the screen by the rake (s) over the higher wall into a trash pit and thence to the sewer.
W71-06375

NEW REGULATIONS AND CONSTRUCTIONS OF STORM-SEWAGE OVERFLOWS, FOR THE RELIEF OF RECEIVING WATERS,
R. Lautrich.
Ber Abwassertech Ver (BABVAD), Vol 19, p 175-193, 1968.

Descriptors: *Regulated flow, Rainfall-runoff relationships.
Identifiers: *Storm overflows.

This paper deals with the relation between the critical rainfall and runoff and the resulting dilution. Investigating the effect of the fundamental lay-out of storm sewage overflows, the author concludes that if two storm sewage overflows are constructed at a given position in place of one, the polluting load discharged to the receiving water can be greatly reduced.
W71-06382

PORTABLE RECORDING OF SEWER FLOW.

Water Wastes Eng, Vol 6, No 12, p 12, Dec 1969.

Descriptors: *Storm runoff, *Manholes, Sewerage, Hydrology.
Identifiers: *Sewer hydraulics, Sanitary sewers, Surface flow, Toronto.

In the region including Toronto, sewer flows were measured in order to assess problems arising from storm flows and infiltration into sanitary sewers. It was found that poor manhole hydraulics in one or two manholes can reduce capacities of large sewer systems. Continued observation and control of methods by which surface water enters sanitary sewers was recommended.
W71-06390

DESIGN OF SUB-SURFACE DRAINAGE SYSTEM FOR INNER RING ROAD OF CITY OF ANTIWERP,
E. W. Brand.
Roads Road Construct, Vol 46, No 546 and 547, p 162-168, Jun 1968, and p 201-207, Jul 1968.

Descriptors: Pump testing, Evaluation, Seepage, Electrical studies, Pipe flow.
Identifiers: *Belgium.

The procedure adopted for the design of a permanent dewatering system for the depressed inner ring road in the City of Antwerp, Belgium is presented. Details are given related to the execution and analysis of extensive field pumping tests; the calculation of seepage quantities; and the study of hydraulics of horizontal intake pipes adopted to effect groundwater lowering. A number of electrical model tests that map flow nets for a number of vaules of parameters determining critical pipe elevations are examined.
W71-06391

RATIONAL 'RATIONAL' METHOD OF STORM DRAINAGE DESIGN.

J Irrigation Drainage Div, Am Soc Civil Engrs, Vol 95, No IR4, p 634-637, Dec 1969.

Descriptors: *Design storm, Time series analysis, Rational formula.
Identifiers: *Sewer hydraulics.

The value of using the rate-duration-frequency curve as the design storm pattern is discussed in reference to intensify-time rainfall charts compiled in Cleveland, Ohio. In complete computation in the Rational Method is due to the omission of time needed for flow traveling through the sewers.
W71-06393

VELOCITY MEASUREMENTS IN SEWERS VITAL TO DESIGN AND MAINTENANCE,
Lamont W. Curtis.
Water Sewage Works, Vol 116, No 4, p 144-147, Apr 1969. 2 diag, 2 tab, 2 graphs, 1 ref.

Descriptors: *Flow measurement, *Sewers, *Analysis, *Methodology, *Velocity, Mannings equation.
Identifiers: *Sewer hydraulics.

Discharges can be converted to waste water volumes per capita in a sanitary sewer, or can be related to rainfall in a storm sewer. The velocity, depth, and slopes measured can be used to compute Manning's coeeficient of the roughness-friction factor. The salt-concentration method of measuring velocity was best suited for developing a discharge-depth relationship for a number of sewers, as well as giving an indication of the condition of the sewer. The equation applicable for the salt-concentration method is Q — AV, where: Q is the discharge; A is the area, computed from the measurement of the flow depth; and, V is the velocity measurement. The equipment needed, procedure, analyses of data, and continuous gaging methods are discussed in detail. It is concluded that there is no ratio, which when applied to surface velocity measurements, will give accurate average velocities in a pipe. Results of the studies indicate, however, that a ratio of .75 will give a good approximation for flow depths between .2 and .4 of the pipe diameter.
W71-06394

DETERMINATION OF FLOOD FLOWS AND DISCHARGE COEFFICIENTS IN MUNICIPAL SEWERAGE SYSTEMS,
T. Dimchev.
Vodosnab Sanit Tekh, Vol 3, p 115-132, 1966, p 115-132, 1966.

Descriptors: *Discharge coefficients, Sewers.
Identifiers: *Bulgaria.

Studies have continued on the discharge properties of sewerage systems in Bulgaria, and results are given for catchment areas in Sofia, Varna, and Burgas. From these data a new formula was developed for calculating the overall discharge coefficie a particular area. The effect of the free volu the sewerage system on the quality of the disc was also considered.
W71-06395

PRACTICAL HYDRAULICS FOR PU WORKS ENGINEER,
F. E. McJunkin, and P. A. Vesilind.
Public Works, Vol 99, No 9, 10 and 11, p 8-8 Sep 1968, p 114-120, Oct 1969, p 77-81, 1968.

Descriptors: *Hydraulic engineering, Multiple pose projects, Flow, Flow measurements, Pum
Identifiers: *Sewer hydraulics.

This article is a review of methods of applicati hydraulic engineering principles and procedur meet the needs of engineers involved in hydr work of design and analysis of public works jects. The conveyance of water by means of fl closed conduits, flow in open conduits, and fu mentals of flow measurement are explored. hydraulics of pumps are investigated.
W71-06398

DEPTH OF FLOW AS DESIGN CRITER FOR CHANNELS WITH ARTIFICIAL LINE
J. C. McWhorter, T. G. Carpenter, and R. N. C Nat Acad Sciences -- Nat Research Counc Highway Research Rec, No 261, p 18-24, 1969

Descriptors: *Design criteria, *Drainage w *Erosion control, *Channels, *Linings, Testing

A study of water disposal systems which drai noff is presented. Six artificial liners were vestigated to develop design criteria for ero channels. Liners installed on flat-bottom channels (2 ft wide, 60 ft long) and on slopes subjected to increasing flows to channel fa Test sections of sand to heavy clay were inserte the channel floor, and the effectiveness of the li was observed. Measurements consist of flow channel and water surface profiles, and test se erosion.
W71-06399

INCREASING SEWAGE FLOW VELOCITY USING CHEMICAL ADDITIVES,
J. L. Overfield, J. K. Baxter, H. R. Crawford, an W. Santry.
Paper presented at Water Pollution Control F 41st Annual Conference, Sep 22-27, 1968.

Descriptors: *Sewers, *Flow rates, *Cost anal *Flow characteristics, *Additives.
Identifiers: *Sewer hydraulics, *Chemical a tives.

It is possible today to increase the flow of sewag an existing sewer without increasing the fluid h This increase can be made by the addition of se tive chemicals. The flow in an overflowing se may be increased to the extent that sewage c not back up in the sewer manhole and overf into streams and house basements. By using th chemicals, it is possible for a community to rel sewer lines of their periodic peak loads with resorting to expensive relief sewers. Data meas during an extensive test program show that can be increased approximately 2.5 times orig flow. Measurements were made on a test fac utilizing six-inch sew pipe (plus auxiliary eq ment required to operate the test facil Biochemical tests were conducted on sew sewage bacteria, fish, and algae to determine verse effects of chemical additives to sewerag receiving streams. No significant adverse eff were found. A cost/effectiveness analysis sho that, for a sample case, it cost less than one hal much to use chemicals to relieve an overflow sewer than to put in a relief line. Developmen improved flow characteristics was based upon w performed by The Western Company, in impro its oil field servicing activities.

71-06400

YDRAULIC DESIGN OF SELF-CLEANING EWAGE TUNNELS,
S. Paintal.
m Soc Civil Engrs, Vol 95, No SA6, p 1182-1184, ec 1969.

escriptors: *Hydraulic design, Sewers, Bed loads. entifiers: *Sewer hydraulics, *Capacity, *Sewage nnels.

he author contends that: (1) the main conern in e design of sewage tunnels is the transportation of coming grit and sewage material; (2) the transorting capacity of water is important because of bearing upon the possible clogging of sewers;) the minimum traction assumed in the design of ewer tunnels must be adequate to keep it oroughly flushed; and (4) the application of exting bed load formulas to fixed bed channels is not esirable.
71-06401

URBULENT FRICTION IN ECCENTRIC ANULAR CONDUITS,
ames M. Robertson.
SCE Combined Sewer Separation Project, Univ f Illinois, T and AM Report No 310, Mar 1968. 13 g, 3 tab, 48 ref. FWPCA Program No 11020 EKO.

escriptors: *Flow around objects, *Head loss, Pressure conduits, Data collections, Flow rates. dentifiers: *Annular pipes, *Hangers, Eccentricity, Sew-in-sewers.

ollowing a general review of the analytical and experimental information on the friction loss encountered by fluids flowing in annular pipes, with particular regard to the influence of eccentricity of the ner member, experiments are described on an valuation of the friction of water in a steel annular ipe of diameter ratios 5.8 and 3.2 in the Reynolds umber range of ten to the fifth power to ten to the xth power. It is found that on a discharge basis, r the same head loss in a given length, with the iameter ratio of 5.8 the flow capacity of the pipe ne is decreased 12.7% in the concentric situation ut only 4.5% with full eccentricity. The latter ecrease is not greatly different from the 3% reduction in area due to the inserted smaller pipe. An nalysis is included showing that for the simple inert at full eccentricity the near-full-flow capacity f a sewer is little affected. The effects of hangers ich as might be employed to support inserts in ewers is found to have an appreciable effect on the ow capacity of a full-flowing sewer.
71-06402

XPERIMENTAL ESTIMATION OF DETENION IN STORM SEWER SYSTEM,
. Sueishi, and A. Katsuya.
rans Japan Soc Civ Engrs, Vol 151, p 47-57, Mar 968.

escriptors: *Storm runoff, *Capacity, Sewer ydraulics.
dentifiers: *Storm sewers, *Capacity, Sewer ydraulics.

esults of an experimental study on storm runoff in urban area showed that the phenomena called as ow detention, retardation, storage and flooding ere hydraulically identical phenomena. These exeriments were made for sewer slopes of 1/200 and 1000. The control structures had negative effects the capacity of dynamic storage except when ooding in the lower area was concerned or when e drainage pump capacity was designed to be epressed. Flooding does not always occur by ineasing the return period, because the maximum te of runoff becomes a steady state when calcuted by the rational method.
71-06404

LONG-TIME DRAINAGE PROBLEM IS ELIMINATED,
Alfred R. Pagan.
Public Works, Vol 100, No 6, p 98-99, Jun 1969.

Descriptors: *Drainage engineering, Design storm, Hydraulics, New Jersey.
Identifiers: *Pipelines.

The manner in which Demarest, New Jersey solved its drainage problem is discussed. The pipe line has a flow velocity during the design storm of less than 9 feet per second. Calculations indicate that the pipe provides an additional margin of capacity for even greater storms. Costs, contractors, and unforeseen complications are discussed.
W71-06405

DEVELOPMENTS IN SEWER MONITORING EQUIPMENT AND TECHNIQUES,
R. Galliers, and M. V. King.
J. Inst Munic Engrs, Vol 97, p 27-31, Jan 1970.

Descriptors: *Instrumentation, *Storm runoff, Sewers.
Identifiers: Sewer hydraulics, Birmingham, Alabama.

This paper describes equipment and techniques developed over the last five years by the City of Birmingham Public Works Department concerning flow in sewers. These methods can be applied to the control of trade effluent discharge, the design of sewers and river channels, and to the solution of drainage problems brought on by sewer flows such as storm overflows on rivers. Automatic equipment only was used to study storm flows since waiting for storm is not feasible. Automatic depth recording of rivers will soon be undertaken to obtain unit hydrographs for intense storms. This is the best method of designing natural catchments. Included are labeled diagrams of equipment used such as the streamline pressure head and recorder for depths of flow and various sampling machines used for qualitative tests on samples taken at known times.
W71-06428

8C. Hydraulic Machinery

TRANSMISSION IN THE 70'S,
Westinghouse Electric Corp., East Pittsburgh, Pa.
R. F. Lawrence.
Westinghouse Eng, Vol 30, No 6, p 180-184, Nov 1970. 5 p, 11 fig, 2 tab, 2 ref.

Descriptors: *Transmission (Electrical), Transmission lines, *Power interchange, Power loads, *Ultra high voltage, Right-of-way, Planning, *Extra high voltage, Reliability, *Interconnected systems, Power system operations, Power system stability, Forecasting, Direct current, Decision making, Underground transmission lines.
Identifiers: Transmission capacity.

Decisions made in the 1970's about kinds and voltage levels of power transmission will establish the patterns for several decades. Surveys and industry reports show no plans for transmission voltage levels above 765 kv. Installation of larger-size generating units will require more and stronger transmission interconnections. The interconnections will require rights-of-way across the countryside and in urban areas that will be more difficult to obtain. Transmission voltages above EHV levels must be seriously considered for best use of rights-of-way and for improvement in power system reliability. Now is not too early to think about building transmission lines for operation at higher UHV voltages in the future. (USBR)
W71-05912

INITIAL EXPERIENCES ON THE 765 KV SYSTEM OF THE AMERICAN ELECTRIC POWER COMPANY (USA),
American Electric Power Service Corp., New York.
H. C. Barnes, and V. Caleca.
Int Conf Large High Tension Elec Syst, Paris, France, Aug-Sept 1970, CIGRE 31-06. 13 p, 16 fig.

Descriptors: *Extra high voltage, Transmission lines, *Test results, *Transmission (Electrical), *Experimental data, Switching surges, Radio interference, Overvoltage, Reliability, Instrumentation, Field tests, Ultra high voltage, Accuracy, Electric power.
Identifiers: Test transmission lines.

159 switching operations and other tests were made on the first 765-kv line and stations placed in service in the USA by the American Electric Power Company. A general description of the sytem is given. Extensive data were obtained and compared with design data in the areas of switching surge overvoltage generation under varied conditions, methods for limiting overvoltages, characteristics of equipment, and radio interference and audible noise. One conclusion is that accurate modeling of magnetic circuits, characteristics of nontransposed lines, and loading factors are required if transient network analyzers are to predict performance with reasonable accuracy; otherwise, results are pessimistic. Results of the initial analysis of collected data are presented. (USBR)
W71-05913

A STUDY OF THE DESIGN PARAMETERS OF UHV LINES,
J. Clade.
Int Conf Large High Tension Elec Syst, Paris, France, Aug-Sept 1970, CIGRE 31-05. 18 p, 10 fig, 6 tab, 9 ref, append.

Descriptors: Electric coronas, Overhead ground wire, Flashover, Ice loads, *Transmission lines, Transmission towers, Contamination, Radio interference, Switching, *Ultra high voltage, Wind pressure, Foreign research, *Design, Interconnected systems, Clearances, Electric corona losses, Electric conductors, Bundled conductors, Electrical faults, Ice.
Identifiers: France, Italy, Great Britain.

The prospects of using UHV lines and their potential functions in France, Italy, and the United Kingdom are reviewed. The main parameters of the 765-kv lines and the reasons and methods adopted for their selection are described. These include conductor specification, switching-impulse level for conductor/tower and conductor/ground clearances, radio interference levels, and pollution requirements of the V-string support insulation selected. Results are included of laboratory studies of impulse and power-frequency flashover and radio interference performance of V-strings and of power-arc performance of the fittings. Overhead ground wire specification and installation are studied with respect to fault-current rating and Joule losses, and a scheme for partially insulated construction is described. The mechanical requirements of the tower design with respect to wind and ice loading are given particular attention. Some common rules for loadings are prescribed and comparisons made between towers designed by each of the 3 countries to these rules and to existing national regulations. (USBR)
W71-05914

SCAPER PRODUCTION SPEEDS PIPE TRENCHING AT LOWER COSTS,
William Donnely.
Construct Methods Equip, Vol 51, No 8, p 38-41, Aug 1969.

Descriptors: *Trenches, *Excavation, *Backfill, *Construction equipment, Comparative costs, Comparative productivity, Linings.
Identifiers: *Scraper.

Extra-wide slots for pipes were opened by scrapers thus adding width that provides operating room for direct machine excavating and backfilling and eliminates any hand shoveling. With this method, the scrapers complete the trenching and backfilling

50% faster with an overall saving of some 20% in total labor costs. Before pipes are placed the trench receives a 2-inch layer of leveling sand followed by a plywood screed creating a contoured bed in the sand for the pipe. A detailed description of the equipment used in the trenching is included.
W71-06287

GRAND COULE THIRD POWERPLANT NOISE CONTROL STUDY,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
T. H. Logan, R. H. Auerbach, C. C. Hutton, and G. J. Serpa.
Available from NTIS as PB-195 714, $3.00 in paper copy, $0.95 in microfiche. Report No REC-OCE-70-49, October 1970. 18 p, 13 fig, 4 tab, 26 ref.
Identifiers: *Noise, *Noise reduction, Sound, Sound waves, Barriers, Turbines, Environmental effects, Environmental tests, Acoustic equipment, Acoustic insulation, Acoustics, Hazards, Measuring instruments, Analysis, Hydroelectric plants, Field tests, Vibrations, *Grand Coulee Powerplant, Wash, Sound dampers, Acoustic energy, Health protection, Operating personnel, Visitor centers.

Grand Coulee Third Powerplant was recognized as a potential source of undesirable noise. Of major concern were noise levels in the residential areas produced by the transformers, exposure of O and M personnel to high noise levels inside the powerplant, and exposure of visitors to high noise levels in the turbine pits and on a crossover bridge above the transformers. Procedures, equipment, noise level measurements made, and method of analysis used to study the problem are presented. Conclusions are: (1) lowering the transformer noise level specification from 89 to 80 dBA, coupled with the barrier effect of the powerplant superstructure and normal attenuation with distance will prevent any appreciable rise of noise level in the residential areas; (2) since the Third Powerplant will be operated remotely, O and M personnel will spend only short periods of time in the noisier parts of the plant, and hearing protectors can be used most effectively; (3) reduced transformer noise levels, coupled with the barrier effect of the bridge structure, will result in acceptable noise levels on the crossover bridge; and (4) noise barriers are necessary in the turbine pits to protect visitors from discomfort and difficulty in conversing.
W71-06329

TRENCHER AND BOX SHIELD MAKE SEWER JOB ALMOST ONE-RIG OPERATION.

Construct Methods Equip, Vol 51, No 4, p 134-135, 138-140 and 143, Apr 1969. 8 fig.

Descriptors: *Excavation, *Construction equipment, *Cost analysis.
Identifiers: *Hydraulic trencher, *Storm sewers, *Guidance system, Oakland, Michigan, Laser beam.

A tractor-powered hydraulic trencher used a three-line bucket arrangement to perform digging for a 43,000-foot storm sewer in Oakland, Michigan. A box shield moved ahead 28 inches at a time and carried a hopper to distribute gravel for the pipe bed. Job difficulties held cost savings to about 10% below conventional backhoeing, but the trencher did protect against cave-ins in addition to providing safety in opening a trench parallel to gas and water lines. The trencher had three basic components: (1) a standard Cat D9 up front; (2) a ladder type bucket line and transverse unloading conveyer; and (3) a hydraulically powered telescoping box that slid along two sled type runners. Dimensions of each part are given along with details of the workings and operation of the trencher and its parts. Loading of spoils to trucks is described. Two guidance systems are mentioned; one which used a survey string line, and the other which employed an Acme laser gun.
W71-06334

TOOLS OF THE BUILDER.

Construct Methods Equip Vol 51, No 2, p 164-168, 170-172, 174-175, 177-178, 180, 183-184, 186, Feb 1969. 15 fig.

Descriptors: *Construction equipment, *Tunneling machines, *Tunneling, *Hydraulic equipment, Tunnel construction, Piping, Control systems, Concrete construction, Electronic equipment.
Identifiers: *Mole, Laser beam.

This article explores advances made since 1963 in equipment used by contractors in non-highway construction. Means for handling, lifting, and moving materials grew steadily in size and power. Conventional-type equipment--cranes, derricks, conveyors, and pumps, became taller, stronger, and more versatile. Earth and rock boring for tunnel construction became easier with the development of machines able to tackle any type of geological formation. Special rigs are described which place large-diameter piping inside long tunnels. Advances in mole tunneling are cited. Hydraulic pumps, driven by electric motors, provide rotation, twist, and up-and-down actions of the boom and bucket, and they also propel the machine. Construction crews use laser beams as constant reference lines. They are visible day and night for long distances and are weak enough to be harmless. Future tunneling may be accomplished by rapid melting of rock with lasers or electron beams. New innovations discussed include: hydraulic-boom cranes, hydraulic fork lifts to handle heavy wall and slab forms, lightweight plastic-foam materials, concrete pumps, electronic computers, and television.
W71-06335

LASER BEAM AND POWDER-ACTUATED TOOL SPEED PIPE LAYING.

Water Sewage Works, Vol 115, No 12, p 574-578, Dec 1968.

Descriptors: *Installation, *Construction equipment, *Application methods, Sewers.
Identifiers: *Laser beam, Laser kit.

A new laser beam-aligner system, which includes a powder-actuated fastening tool as basic hardware, is enabling contractors to complete sewage installations at least 35% faster and with virtually 100% accuracy. Basic kit and hardware can meet more than 95% of requirements for average storm and sanitary sewer contracting job. Laser kit is designed for application with precast manhole with concrete base, concrete base without precast manhole, or simple bottom-of-the-ditch installation without concrete base. It is accurate in uphill or downhill alignments.
W71-06354

TRENCHLESS PIPELAYING DEMONSTRATED.

Water Waste Treat, Vol 12, No 2, p 71, Jul/Aug 1968.

Descriptors: *Tunneling machines.
Identifiers: *Great Britain, *Badger Major.

The Badger Major, a trenchless pipelaying machine, has been designed to revolutionize the laying and ducting of plastic pipes, pvc pipes, and cables in all types of soil and climatic conditions for water supply, sewage, land drainage, etc. The Badger Major works on a trenchless principle, passing through the ground a narrow blade with specially designed expanders at its base to create a smooth tunnel for the pipe. The control of the machine is fully automated by the use of an infrared light beam and hydraulic systems engineering. The system gives a working range of 2000 feet; accuracies of plus or minus 1/2 inch vertically and plus or minus 3 inches laterally are achieved.
W71-06358

BUILDING DRAINAGE PUMP STATIO WITHIN LIMITED BUDGET,
E. W. Fritschi.
Public Works, Vol 100, No 2, p 104-105, F 1969.

Descriptors: *Design, *Louisiana, *Pumpi plants, Construction.

The design of a pump station, located 15 mi south of New Orleans, is described. The prima stage of the pump station was designed for rainf of 2.5 in. for one hour and then 1/2 in./hr for a to of 6 in. Emphasis was placed on the design of a su structure which had to serve as a cofferda preventing leakage from the tail bay into the su tion bay, and as a retaining wall resisting vertic horizontal and lateral forces. Requirements we met by designing a series of bays that structura act as a continuous arch bridge.
W71-06378

SOLVING A SEWER OVERFLOW PROBLEM,
Charles R. North.
Public Works, Vol 97, No 4, p 92, Apr 1966. diag.

Descriptors: *Sewers, *Design, *Planning, *Pum ing plants, *Overflow, Investigations.
Identifiers: *Painesville, Ohio.

The 1910 sewer line in Painesville, Ohio discussed. A pump station and force mains we added to an existing sanitary sewer system, a subsequently caused flooding. An investigation w undertaken to identify and correct the cause of t problem. The following conclusions were include (1) in future designs, considering the capacity older sewers as two-thirds full; (2) recommendi of camera inspection with semi-annnual cleani (3) running of pumps on an alternate basis; (telemetering; (5) checking of the upstream side the pump station for excessive infiltration; and, (checking the operation of the regulator.
W71-06387

8D. Soil Mechanics

THE INFLUENCE OF STRAINS IN SOI MECHANICS,
Cambridge Univ. (England).
K. H. Roscoe.
Geotech, Vol 20, No 2, p 129-170, June 1970. p, 36 fig, 1 tab, 56 ref.

Descriptors: Soil engineering, *Soil mechanics, So properties, Soil tests, Stress, *Strain, Shear tests Stress-strain curves, Foreign research, *Deform tion, *Soils, Displacements, Bibliographie Behavior, Retaining walls, Foundations, *Mod tests, Loads (Forces), Soil pressure, Stress distrib tion, Soil classifications, Test equipment.
Identifiers: Soil-structure interaction, Stress path *Rankine Lectures, Coulomb-Mohr criterion.

The aims of a research program at Cambrid University, Great Britain, on the stress-stra behavior of soils are outlined. The principal obje tive of the research is to develop simple metho for making reliable predictions concerning th load-deformation characteristics of soils at working loads. The pressing need for studying th load-deformation behavior of soils in mixed bou dary value problems at model scale is emphasize New versatile shear test equipment than can im pose a wide range of stress and strain paths, an nondestructive methods of checking the uniformi of the behavior of specimens are described. Typic data presented for one problem illustrate the vari tion of the passive pressure on a retaining wall wi the displacement of the wall into sand. A revise statement of the Mohr-Coulomb failure criterion proposed, taking into consideration the eviden that rupture surfaces coincide with zero-extensio lines. Relationships of stress with velocity chara teristics are discussed, and how they might be use to determine the load-deflection behavior of an

ructure on or in soil is indicated. The immediate ractical importance of centrifugal model tests is nown. (USBR)
V71-05907

NGINEERING BEHAVIOR AND STRUCTURE F COMPACTED CLAY,
niversity of Strathclyde, Glasgow (Scotland); and alford Univ. (England).
. Barden, and G. R. Sides.
roc Amer Soc Civ Eng, J Soil Mech Found Div, ol 96, No SM4, p 1171-1200, July 1970. 30 p, 18 g, 1 tab, 67 ref, 2 append.

escriptors: Behavior, Clays, *Compacted soils, Soil structure, Soil tests, Soil engineering, *Soil echanics, Soil properties, Moisture content, Consolidation, Pore air pressure, Pore water pressure, *Pore pressure, Soil compaction, Collapse, welling, Permeability, Negative pore pressure, oreign research, Bibliographies, Microstructure.
dentifiers: Soil pore structure, Great Britain.

ngineering properties of a compacted, partly saturated clay have been determined in a comprehensive series of laboratory investigations. Results ave been correlated with previously published esults of a large number of workers on other clays. Molding water content has had a dominant effect n a wide range of engineering properties of a compacted clay soil. Microscopic examination of the oil structure shows that the major differences exist n the macrostructure, and these have accounted or the main variations in engineering behavior. The practical implications of the findings relate mainly to the pore pressure and consolidation ehavior of compacted clay fill. Natural, partly aturated clays will exhibit many similarities, depending on whether the air voids are continuous or ccluded. When clays are dry of the Proctor optimum moisture content, with continuous air voids, o consolidation problem exists in the classical ense; major problems are associated with swelling r collapse on wetting. Wet of the Proctor optimum, with occluded air voids, consolidation is a najor problem and the Terzaghi theory is generally s relevant as any of the more complex theories. (USBR)
W71-05908

REVIEW OF SHEARING STRENGTH OF ROCKFILL,
T. M. Leps.
Proc Amer Soc Civ Eng, J Soil Mech Found Div, Vol 96, No SM4, p 1159-1170, July 1970. 12 p, 1 ig, 5 tab, 9 ref, append.

Descriptors: *Rock fills, Rockfill dams, Rock properties, Internal friction, Soil mechanics, *Shear trength, Shear tests, *Reviews, High pressure, Variability, Normal stress, Slope stability, Particle hape, Low pressure, Confining pressure, Rock lope stability, Rock tests, Triaxial tests.
dentifiers: Friction factors.

The steady development of large-scale triaxial hear testing equipment in the United States and Mexico has permitted the laboratory testing of ockfill specimens having up to 8-in.-size particles. pecimens of smaller-size particles can be tested nder confining pressures up to 2000 psi. A review nd consolidation of published test data and reorts show that competent authorities have found ockfill friction angles varying widely with various arameters such as confining pressure, relative ensity, gradation, particle strength, degree of saturation, and particle shape. The most basic parameer appears to be confining pressure, with the consistent indication being that for average dumped ockfill, the friction angle varies from about 55 deg t very low normal pressure to about 35 deg at very igh normal pressure. (USBR)
V71-05910

SETTLEMENT PROBLEM ORIENTED COMPUTER LANGUAGE,
Illinois Univ., Chicago; and Massachusetts Inst. of Tech., Cambridge.
R. L. Schiffman, R. V. Whitman, and J. C. Jordan.
Proc Amer Soc Civ Eng, J Soil Mech Found Div, Vol 96, No SM2, p 649-669, Mar 1970. 21 p, 10 fig, 7 tab, 19 ref, 2 append.

Descriptors: Bibliographies, *Computer programs, *Foundations, *Soil mechanics, Rockfill dams, Foundation investigations, Computer systems programs, *Computer applications, *Settlement (Structural), Test fills.
Identifiers: *SEPOL (Computer system), ICES (Computer system).

Settlement Problem Oriented Language (SEPOL) is designed to aid in the calculation of predicted magnitudes and progress of settlement for shallow foundations. The version of SEPOL described in this paper operates within the framework of the ICES system. The operation of ICES SEPOL-1 is described using 2 examples. The first example calculates the stresses beneath a rockfill dam; the second example presents the calculations of magnitude and progress of settlement beneath a test fill. (USBR)
W71-05915

EXPERIMENTAL AND THEORETICAL INVESTIGATIONS OF A PASSIVE EARTH PRESSURE PROBLEM,
Cambridge Univ. (England).
R. G. James, and P. L. Bransby.
Geotech, Vol 20, No 1, p 17-37, Mar 1970. 23 p, 20 fig, 1 tab, 38 ref.

Descriptors: Bibliographies, *Soil mechanics, *Earth pressure, Sands, *Passive pressure, Laboratory tests, *Retaining walls, Rupturing, *Soil pressure, Failure (Mechanics), Pressure, Failure surfaces.
Identifiers: *Plane strain.

The paper presents data from the experimental investigation of the passive failure of an initially vertical, rough, plane wall which is rotated about its toe into a mass of dry sand with an unloaded horizontal surface. The sand is constrained to deform in plane strain. Measurements are made of the distribution of the normal and shear stresses on the wall while strain fields are determined from observations by an X-ray technique of the positions of lead shot buried in the sand mass. The form of the rupture surface mechanism in dense sand is determined. (USBR)
W71-05919

PREDICTION OF MOISTURE MOVEMENT IN EXPANSIVE CLAYS,
Texas Univ., Austin. Center for Highway Research.
For primary bibliographic entry see Field 02G.
W71-06272

8E. Rock Mechanics and Geology

FORMATION EVALUATION BY INSPECTION WITH THE BOREHOLE TELEVIEWER,
Mobil Research and Development Corp., Dallas, Tex.
For primary bibliographic entry see Field 07B.
W71-05916

THE NUMERICAL DETERMINATION OF STRESSES AND DEFORMATIONS IN ROCK TAKING INTO ACCOUNT DISCONTINUITIES,
Karlsruhe Univ. (West Germany).
H. Malina.
Rock Mech, Vol 2, No 1, p 1-16, May 1970. 16 p, 9 fig, 23 ref.

Descriptors: Rocks, Fissures (Geology), Stress, Strain, Theoretical analysis, Bearing capacities, Analysis, Bibliographies, *Rock mechanics, Joints (Geology), *Rock foundations, Rock properties, *Footings, *Finite element method, *Foundations.
Identifiers: Computer applications, Rock footings, Geomechanics.

The finite element method allows the numerical determination of stresses and strains in elastic structures of arbitrary shape. The author uses the method to handle geomechanical problems after additional steps have been introduced to meet the special requirements of geomechanics. In evaluating stresses and strains, calculating the mechanical influence of given joint systems and additional joints caused by material fractures is possible. The paper contains an introduction to the principles of the finite element method and a description of the additional steps required to include inelastic properties. The method of calculation has been programmed for digital computers and has been tested successfully. An example of a continuous footing on rock with one system of joints demonstrates the applicability of the method. (USBR)
W71-05917

MODIFIED TRENCHER SLICES THROUGH FLINT-HARD ROCK,
Lorraine Smith.
Construct Methods Equip, Vol 52, No 6, p 74-78, Jun 1970. 10 fig.

Descriptors: *Rock excavation, *Drilling equipment, *Drainage systems.
Identifiers: *Storm sewers, *Trencher.

A Texas contractor bought a strong stock model trencher and modified it to meet the need for a storm sewer to be cut through hard rock in downtown areas where blasting is forbidden. Major changes in the rig include the addition of three unique features: an adjustable three-part wheel, an hydraulic mast, and an adjustable crumbing shoe. Minor modifications include: converting the mechanical drive train from a 21- to a 42-tooth sprocket to increase torque on the cutting wheel, reinforcing the idler axle, and replacing an 8-foot Jetco arc-type conveyor with the Parsons original. The trencher not only cut through flinty rock, but it kept well ahead of rigs forming the cast-in-place drain.
W71-06411

8F. Concrete

STABILIZED BASE FOR RESIDENTIAL STREETS,
W. J. Gallup.
Civil Eng, Vol 39, No 5, p 40-42, May 1969.

Descriptors: *Design, *Construction materials, *Illinois, Cements, Construction equipment.

A public works project devised to improve streets and drainage in Stickney Township, Ill. is described. For street improvements, soil cement was used to stabilize bases when streets were covered with 2 in. of asphalt. Depending on the conditions in a particular area, a contractor would either set up a central-mix plant to process base material or would mix it in place. Excavation for the central-mix operation was done with a track-type end loader, a motor grader and dump trucks. Equipment as well as self-loading scrapers were used for in-place processing.
W71-06292

REHABILITATION OF A CONCERT SEWER UNDER INFILTRATION PRESSURE,
Harold H. Haugh.
Public Works, Vol 100, No 7, p 89-90, Jul 1969.

Descriptors: *Concrete additives, Concrete technology, Sewers.
Identifiers: Coating method.

The successful conversion of a storm sewer into a sanitary sewer in Albert Lea, Minnesota is discussed. It was necessary to apply Cital-Aquacoat as a coating on the wet surface of the concrete sewer, which was under hydrostatic head conditions, in order to give the required protection.
W71-06294

WINNER 3.6% UNDER ON CALIFORNIA STORM DRAIN.

Eng News-Record, Vol 184, No 3, p 46, Jan 15, 1970. 1 tab.

Descriptors: *Construction materials, *Costs, *Concrete pipes, *Concrete construction, *Bids, California.
Identifiers: *Bedding material, Solid shoring, Storm drainage system.

Costs and quantities of materials proposed for use in the construction of a storm drainage system in Torrance and Los Angeles, Calif. are tabled for the two lowest contract bidders. The hired contractor will use reinforced concrete box construction and reinforced concrete pipe. Excavated sandy silt material will be used for bedding. Solid shoring is necessary for most of the project.
W71-06340

SEWER IMPROVEMENTS CALL FOR TRUNK.

Water Sewage Works, Vol 116, No 10, p 406-407, Oct 1969. 3 fig.

Descriptors: *Construction materials, *Pipelines, *Installation, Infiltration.
Identifiers: *Asbestos-cement piping, *Palo Alto, California.

Asbestos-cement piping was installed in Palo Alto when urban growth caused an increase in sewer problems and demands. Because a large portion of the pipe had to be laid below the water table level, city engineers considered endurance, infiltration factors, and a construction course in deciding upon materials for the sewers. Steps in the installation procedure were outlined. Prior to final acceptance of this trunk line, tests were performed, and no infiltration was found. Dimensions are listed for amounts used of each type of asbestos-cement piping in the three-mile project.
W71-06353

UNDERWATER LINE SPANS 32 FEET BETWEEN SUPPORTS.

Am City, Vol 84, No 8, p 58, Aug 1969.

Descriptors: *Concrete pipes, *Installation, *Construction equipment.
Identifiers: *Underwater pipeline.

An underwater pipeline of prestressed concrete units was installed in St. John's River as an outfall sewer from a waste treatment plant to serve a new industrial area of Jacksonville, Florida. Double sections of cylinder pipe were laid on concrete piles topped with precast concrete caps to cradle the pipe. Scuba divers guided and joined pipe sections. Extensions and other installation techniques are given.
W71-06362

PAVING CURES DUST AND DRAINAGE ILLS,
Jack Lough.
Am City, Vol 84, No 7, p 97-98, Jul 1969.

Descriptors: Concrete construction, Drainage programs, Storm runoff.
Identifiers: Street drainage.

A far-reaching street-paving program was implemented in Albion, Nebraska after heavy rains caused driveway culverts to overflow, ditchwater to stagnate, and runoff to spill into streets and parkways because ditches were clogged. Concrete curbs, gutters, and pavements were installed to ameliorate this situation and also to provide dust control. The entire project cost $473,619.48 (about $5700 per block).
W71-06383

CALCAREOUS PIPE FOR SEWERS,
R. D. Pomeroy.
J Water Pollution Control Fed, Vol 41, No 8, p 1491-1493, Aug 1969.

Descriptors: *Aggregates, *Concrete pipes, *Sewers, *Testing, *Pipes, *Corrosion, Drainage water.
Identifiers: *Pipe materials.

Although the use of calcareous aggregate in the manufacture of concrete pipe for sewers has been advocated for those situations where there is a hazard of mild sulfide conditions, there is a lack of data comparing this material with others. Tests on five 8-inch diameter pipes handling septic waste water were run for a period of seven years. Results show that the rate of corrosion was inversely proportional to the alkalinity of the pipe materials. The pipe with composition of type II cement plus limestone aggregate had a rate of corrosion approximately one-third as great as the average of the others made without limestone aggregate.
W71-06407

LOW COST STORM DRAINAGE WITH PAVED CHANNELS,
Clifford Wendell, and Robert Emmons.
Public Works, Vol 101, No 4, p 110-111, Apr 1970.

Descriptors: *Drainage systems, Design data, Concrete construction, Storm drains.
Identifiers: *Drainage channels.

Rockford, Illinois realized almost a 45% reduction in costs on its drainage system construction by installing concrete paved drainage channels instead of conventional storm sewer systems. Rainfall-runoff data was utilized in designing the channels for the 50-year frequency storm. This longer frequency design provides more adequate protection from flooding, and the channels still retain their self-cleaning capabilities. Dimensions and design diagrams of the paved drainage channels are given.
W71-06413

8G. Materials

IMPROVEMENT OF THE CORROSION RESISTANCE OF ALUMINUM BRASS FOR USE IN SEA WATER CONVERSION PLANTS,
IIT Research Inst., Chicago, Ill.
M. A. H. Howes.
For sale by the SOD, GPO, Wash, DC, 20402, Price $0.50. Office of Saline Water Research and Development Progress Report No 628, December 1970. 42 p, 3 tab, 28 fig, 5 ref. OSW Contract 14-01-0001-1770.

Descriptors: *Desalination, *Copper alloys, *Corrosion, *Protective coatings, *Aluminum alloys, Oxidation.
Identifiers: Aluminum-brass, Boehmite, *Aluminum oxide.

The objective of this program was to develop a selective oxidation process which would yield a coherent corrosion-resistant surface layer on aluminum brass. The process was to be suitable for application on industrial equipment. Sixteen different atmosphere compositions were used at temperatures from 800 to 1400F. It was found that the corrosion resistance of aluminum brass could be significantly improved by heating in partially oxidizing atmospheres at 1200 to 1400F. These results are based on autoclave testing, and final conclusions cannot be drawn regarding the effectiveness of the enhanced surface layer until further loop t
completed. However, at this stage selective
tion seems a very promising way of reducing
sion rate and improving the life of aluminu
in seawater converters. (Filban-Office of
Water)
W71-06234

**Application of Iron-Aluminum Base Al
Saline Water Conversion,**
Solar, San Diego, Calif.
E. R. Duffy, and J. F. Nachman.
For sale by the SOD, GPO, Wash, DC, .
Price $0.60. Office of Saline Water Resear
Development Progress Report No 626, De
1970. 53 p, 9 tab, 29 fig, 10 ref. OSW Contr
01-0001-1796

Descriptors: *Desalination, *Corrosion, *P
loys, Iron, Aluminum alloys.
Identifiers: *Iron-aluminum, Alfenol, Therm

The objective of this program is the develop
iron-aluminum base alloys which retain res
to sea water corrosion with minimum alu
content and, therefore, maximum ductiliti
scope of testing includes systematic evalua
sea water corrosion resistance of three iri
minum base alloy systems: Alfenol (Fe .. Al
menol (Fe .. Al .. Mo), Modified Thermen
Al .. Mo .. Zr). The program is divided int
stages (1) Fabrication of Test Samples, (2)
ing Tests, and (3) Advanced Testing. The
loys with the highest aluminum content, alo
the Thermenol alloy containing ten perce
minum, were selected for advanced testing.
baseline nor iron-aluminum alloys were seve
tacked in the autoclave. The most severe att
curred with a Modified Thermenol alloy w
percent aluminum in sea water steam at 280
alloy was found to be the most corrosion re
iron-aluminum alloy in moving sea wate
molybdenum-bearing iron-aluminum alloys
and 16 percent aluminum were equal to or s
to cupro-nickel in velocity tests at room te
ture. However, only the Modified Thermeno
with 16 percent aluminum approached the
sion resistance of cupro-nickel at 190F. (Filb
fice of Saline Water)
W71-06235

**PLASTICS IN WATER AND SEWAGE
TROL,**
G. M. Cave.
Surveyor, Vol 84, No 4041, p 44, Nov 21,
fig.

Descriptors: *Plastics, *Flow control, *C
systems, *Construction materials, *Equipme

Rigid plastics, able to provide structural as
protective functions, are suggested for use
control equipment such as valves, penstocks
gates, etc. Improvements made in plastics o
years are noted, and requirements needed
troducing the materials to industry are liste
listed are advantages of well-designed plasti
stock compared to a conventional unit in ca
with copper-alloy sealing and bearing su
Benefits of these modern materials cannot b
ized until they are employed to a greater ex
civil engineering contractors and by engin
the water purification industry.
W71-06286

**GLASS FIBER-REINFORCED PLASTICS
FOR WATER PIPELINES,**
E. Faust.
Kunststoffe-Plastics (KUPLAK), Vol 15, N
191-193, 1968.

Descriptors: *Pipelines, *Plastics, Constr
equipment, Sewers.
Identifiers: *Fiberglass pipe.

Glass fiber-reinforced plastic pipes for water pipelines and sewer pipe systems are described. The technical and economic advantages of applications of plastics in sewer pipes are detailed. Requirements that must be taken into account in selecting proper plastics for special purposes with regard to the use of a glass reinforced polyester pipe are mentioned. The properties and performance of the pipe made by filament winding and centrifugal casting techniques are listed, and the comparison of the production method by filament winding with that by centrifugal casting is examined.
W71-06291

FIBERGLASS WINS PIPELINE,
William Marquardt.
Water Sewage Works, Vol 116, No 6, p 228-229, Jun 1969. 3 fig.

Descriptors: *Bids, *Piping systems (Mechanical), Construction materials, Comparative costs.
Identifiers: *Fiberglass pipe, *San Francisco.

Corrosion resistant fiberglass was chosen over a cement-mortar lined steel pipe in competitive bidding for the replacement of a corroded waste return piping system in the San Francisco area. The fiberglass pipe weighed one-tenth of the weight of the cement-lined steel pipe, and the cost of the fiberglass pipe was $5 per foot less. Hydrogen sulfide caused leakage of the original pipe by penetrating the cement lining and steel wall at the welded seams. Three types of fiberglass reinforced plastic (FRP) were used in constructing various parts of the waste return piping system. Dimensions and descriptions of the three pipe types are given, and installation methods are also discussed. Alternate materials investigated and rejected were: cement-lined steel, cement-lined cast iron, asbestos cement, plastic protected metal (IPM), reinforced concrete, glass or glass-lined pipe, uncoated steel or cast iron, epoxy-coated steel, and vitrified clay pipe. Reasons for rejecting these materials were given.
W71-06300

SEWERS UNDER ATTACK,
G. L. Marsden-Jones, and J. A. Foster.
Surveyor, Vol 85, No 4053 and 4055, Feb 13 and 27, 1970. 3 p.

Descriptors: *Construction materials, *Pipes, *Concrete pipes, Asbestos cement.
Identifiers: *Sanitary sewers.

G. L. Marsden-Jones: With reference to the article, 'Sewers Under Attack' (9 January), he questions whether or not the use of bitumen-coated asbestos pipe implied that concrete could not be used for sanitary sewers. He also wonders if gravel used to surround pipes produces a drainage effect that harms farm land where groundwater is short in supply and, at sewage works, raises groundwater level causing floods. J. A. Foster: In reply to this first question, he notes that only the specific circumstances at Doncaster warranted use of bitumen asbestos-cement pipes and that for most sanitary sewers, concrete is a suitable material. He further explains reasons for Doncaster's use of the unusual material. In answer to the second point, he states that normal practice in waterlogged ground is to supply impervious clay cut-off walls at proper intervals to prevent groundwater movement along pipelines.
W71-06301

PLASTIC FITTINGS SPEED LAYING OF SEWER PIPE.

Eng Contract Record, Vol 81, No 10, p 73, Oct 1968.

Descriptors: *Pipes, *Construction equipment, *Construction materials, Installation.
Identifiers: *Transite pipe system.

The Roll-Tite system which combines a Transite asbestos-cement pipe with a new type of plastic fitting blow-molded from black polypropylene, is described. The installing operation for this system takes considerably less time than for other systems. Other advantages of this system as well as distributive information are mentioned.
W71-06338

PLASTIC MAY BE PIPELINER'S BOON.

Eng News-Record, Vol 184, No 10, p 28-29 Mar 5, 1970.

Descriptors: *Plastic pipes, *Installation, Cost comparisons, Construction materials.
Identifiers: *Germany, *Fusion welding.

In Germany, plastic pipes with up to 40-inch diameters and pieced in 500 to 1,000 foot sections are common engineering equipment. These polyethylene pipes cost slightly more than other types of pipes; however, installation costs are drastically lower, especially when used in long runs. The butt-fusion welding practice is quite routine in Europe. This process of installation is described.
W71-06339

SEWERS UNDER ATTACK.

Surveyor, Vol 85, No 4048, p 38, Jan 9, 1970. 2 fig.

Descriptors: *Construction, *Construction materials, *Sewers, *Pipes, *Installation, Cements.
Identifiers: *Great Britain.

Doncaster sewers were improved once in 1956, but in 1966 a major reconstruction of the pipes was necessitated due to corrosion by sulfuric acid produced by bacterial action. Adjacent to the old sewer, the new sewer was constructed in the material most resistant and readily available, namely, bitumen-coated asbestos-cement. Procedures followed for construction and installation of the pipes is described.
W71-06349

PUBLIC WORKS EXHIBITION PREVIEW.

Surveyor, Vol 82, No 3988, p 82, 130, 135, Nov 9, 1968. 5 fig.

Descriptors: *Construction materials, *Construction equipment, *Drainage systems, *Underground structures, Sewerage, Plastic pipes, Pipes.

Among the previewed exhibits of the Public Works and Municipal Services Exhibition were Metrex sewage and drainage and rigid PVC rainwater systems, a large range of PVC pressure pipe, examples of asbestos-cement pressure pipes, Polydrain PVC underground drainage systems, and plastic pipes. The PVC pressure pipes had a push type Z joint with a lip rubber seal. This joint, which is easy and quick to assemble, had been made practicable for pressure mains of large diameters up to 18 inches. The asbestos-cement pipe display showed not only new pipes but also old, well-preserved pipe that had lain in the soil for many years. One exhibit demonstrated the economy gained in cost, labor, weight, and maintenance when using plastic pipes and systems.
W71-06350

DRAINAGE AND TREATMENT.
For primary bibliographic entry see Field 05G.
W71-06351

ALUMINUM PIPELINE FOR SEA OUTFALL SEWER.
Water Waste Treat, Vol 12, No 11, p 361, Jan/Feb 1970.

Descriptors: *Aluminum, *Pipelines, *Installation, *Construction equipment, *Construction materials, Outfall.
Identifiers: *Great Britain, *Trestles.

A welded aluminum pipeline has been used to extend a sea outfall sewer at Anglesey. Aluminum was selected because of its weight, corrosive nonliability, strength, and resistance to seawater and domestic sewage. The pipeline was assembled progressively by bolting the flanged ends of the 100-foot pieces underwater. The aluminum trestles, to support the pipeline, and the method of installation are described.
W71-06355

STEEL PIPE SELECTED FOR STORM SEWER SYSTEM.

Am City, Vol 85, No 3, p 22, Mar 1970.

Descriptors: *Pipes, Construction costs.
Identifiers: Steel pipes, Storm sewers, Sewer system.

Steel piping instead of the more-commonly used reinforced concrete was employed to construct a storm sewer system in Lakewood, New York. Advantages of this material include its strength, lighter weight, and lower cost. Savings in material cost alone were about 15%, and lower labor costs were incurred because steel is simpler to handle than other materials. Dimensions of the storm sewer system are given.
W71-06360

STEEL STORM SEWER SAVES MONEY FOR PHOENIX,
Sam A. Phillips.
Water Wastes Eng, Vol 6, No 4, p 56-57, Apr 1969.

Descriptors: *Storm drains, *Installation costs, Construction materials, Steel.
Identifiers: *Storm sewers.

In order to fulfill the need for additional storm sewers at the lowest possible cost, the City of Phoenix asked for bids on types of materials which could be used in the construction of an efficient and durable storm drainage system. The city lately installed two such pipelines of asphalt-lined and corrugated, galvanized steel for a cost 20 to 25% below the city engineers' estimate given before other bids were requested. Completed in 1967, these new systems appear completely satisfactory, and their installation was accomplished with greater facility and speed than is usual when materials other than galvanized steel are used.
W71-06406

INSULATED CO-AXIAL PIPELINES,
J. S. W. Riach.
Pipes Pipelines Intern, Vol 13, No 11, p 27-28, 30, Nov 1968.

Descriptors: *Pipes, *Installation, *Piping systems (Mechanical), Drainage.

The installation procedure of a conduit system of inner and outer pipes that is prefabricated off-site in 40 ft lengths together with all elbows, expansion loops, tees, and other special sections is described. It is then delivered to the site for assembly. The annular air space between service pipe insulation and the interior of conduit provides drainage passage for any water which may inadvertently enter the system.
W71-06408

GALVANIZED BETH-CU-LOY STEEL SHEETS - FOR CULVERT PIPE AND UNDERDRAINS.
Bethcon Galvanized Steel Sheets, Bethlehem Steel, Bethlehem, Pa., Booklet 1956, p13-14. 2 fig.

Descriptors: *Steel, *Fabrication, *Construction materials.

Identifiers: *Beth-Cu-Loy.

Beth-Cu-Loy is Bethlehem's trade name for steel which has a small amount (.2 to .3 percent) of copper added to it for resistance to corrosion. When given a 2-oz coating of zinc, and then corrugated, these steel sheets form ideal materials for fabrication of culvert and drainage structures. Bethlehem manufactures culvert sheets for fabricators who form them into culverts and underdrains. Dimensions available are given along with advantages of the materials used, such as their strength and their light weight.
W71-06419

CORRUGATED STEEL PIPE STORM SEWERS.

National Corrugated Steel Pipe Assoc, Schiller Park, Illinois, Booklet STM 168. 32 p.

Descriptors: *Construction materials, *Steel, *Culverts, *Design, *Steel pipes, *Construction equipment, Installation, Data collections, Design standards.
Identifiers: *Storm sewers.

Corrugated steel is the accustomed material used in urban areas for culverts and storm sewers which form a part of Interstate highway construction. This technical manual provides information needed for the design of storm sewers which differ from culverts in details of hydraulics and fittings. The use of corrugated steel pipe insures that the following essentials will be provided: (1) strength, (2) positive couplings, (3) long service life, (4) unchanging hydraulic properties, (5) versatile fittings, and (6) proved materials. Each of these factors is demonstrated in corrugated steel pipe storm sewers. Product details are discussed, including sizes and details of the pipe and pipe-arch; couplers and fittings; and bituminous protective coatings. Technical data explained include: hydraulics and the determination of size, Manning charts, structural design, the height of cover tables, and service life design. Also described are techniques for installation and specifications for materials, fabrication, workmanship and finish, and inspection.
W71-06420

TANKS.

Owens-Corning Fiberglas Corp, Toledo, Ohio, Publ No 1-PE-3578-F, June 1970. 8 p.

Descriptors: *Storage tanks, *Construction materials, *Construction equipment, *Design, *Plastics, Treatment facilities.
Identifiers: *Fiberglas reinforced plastics.

The combined Fiberglas reinforced plastics have been utilized for years in demanding applications because of their chemical and electrolytic corrosion resistance and structural stability. The process industry uses these plastics for chemical storage tanks, gathering lines, salt water injection, and disposal oil well tubing. A detailed description of the design and manufacturing of Fiberglas Reinforced Plastic (FRP) storage tanks is included. Applications for this type of non-corrosive tank are mentioned with special reference to the use of Fiberglas tanks in providing the most economical solution to severe corrosive problems in holding, treating, and settling tanks.
W71-06421

PLASTICS IN WATER AND SEWAGE CONTROL,
C. A. J. Benfield.
Surveyor, Vol 85, No 4048, p 2, Jan 9, 1970.

Descriptors: *Construction materials, *Design criteria, *Plastics.
Identifiers: *Polyester resins.

In this letter to the editor, the author attempts to clarify the original article's reference to inadequacies of glass fiber reinforced polyester resin (RP) when submersed in water. He notes that considerable research has shown raw materials in the form of improved polyester resins, glass sizes, and fabricating processes to permit application of RP in environments of total immersion in water. Practical experience has demonstrated that by considering certain design criteria, RP laminates can be and are being used in the water and sewage control industry. The author also suggests that 'case histories', written by users of plastics components, be published in the journal in order to promote dissemination of design and performance data within the water purification industry, as was recommended in the original article.
W71-06424

PLASTIC RELINING OF SMALL-DIAMETER PIPES,
Raymond M. Bremver.
J Saint Eng Div, Am Soc Civil Engrs, Vol 96, No SA2, p 297-317, Apr 1970.

Descriptors: *Storm drains, *Sewerage, Pipes.
Identifiers: *Toronto, *Storm sewers, *Combined sewers, Plastic pipes, Capacity.

The combined sewer system of the city of Toronto measures approximately 933 miles. In 1965, a 25 year staged and planned program for installing new storm sewers at a net cost of $154 million was instituted as a result of the hydraulic inadequacies of the then existing system. A chart showing the inventory results concerning the sewer system is given. The surcharge amount on water bills is explained and the common defects in the existing sewers are discussed. A detailed report on the method of relining the existing sewers, which involves the insertion of high density plastic pipes into the sewers and the connecting of all private and catch basin drains into the plastic conduit, is given. The effect of relining on hydraulic capacity is explained.
W71-06426

8H. Rapid Excavation

RADIOCHEMICAL ANALYSES OF WATER FROM SELECTED STREAMS, WELLS, SPRINGS, AND PRECIPITATION COLLECTED PRIOR TO REENTRY DRILLING, PROJECT RULISON,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05A.
W71-05842

GEOHYDROLOGY OF THE AREA NEAR WOSCO EXPLORATORY HOLE NUMBER 1, UINTAH COUNTY, UTAH,
Geological Survey, Denver, Colo.
J. E. Weir, Jr.
Geological Survey open-file report USGS-30021, December 1970. 27 p, 7 fig, 8 tab, 10 ref. USAEC Agreement No AT- (49-61)-3002.

Descriptors: *Hydrogeology, *Nuclear explosions, *Underground, *Utah, *Subsurface investigations, Oil shale, Exploration, Drilling, Drill holes, Aquifer characteristics, Water yield, Water wells, Flow rates, Water quality, Fractures (Geology), Chemical analysis, Geology, Radiochemical analysis, Spectroscopy, Water levels, Test procedures, Data collections, Logging (Recording), Oil wells, Groundwater movement.
Identifiers: Exploratory hole.

In order to assess the feasibility of fracturing the oil shale in the central part of Uinta Basin in Uintah County, Utah by underground explosion of a nuclear device, an exploratory hole (WOSCO exploratory hole Ex. 1) was drilled during July 1969. Geohydrologic data obtained from this hole, drilled to a depth of 3,234 feet, and other nearby wells are presented along with an interpretation of the data. Jetting tests and a flow test of three water-bearing zones in the Green River Formation of Eocene age indicated very low transmissivities (6 to 18 gallons per day per foot) and hydraulic heads sufficient to cause flow at the surface. The three zones had a combined flow of 5 gallons per minute. Water from these zones is briny, ranging in concentration from 37,000 to 72,700 milligrams per liter of dissolved solids. If a nuclear explosive is detonated at a depth of 2,370 feet, just below the apparent richest kerogen-bearing part of the oil shale penetrated, fracturing reportedly would not extend downward into the upper water-bearing zone of the Green River Formation. Under these conditions, water very likely will not flow into the rubble chimney made by the nuclear explosion. (Woodard-USGS)
W71-06153

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

OPTIMIZATION TECHNIQUES FOR WATER RESOURCE SYSTEMS,
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 06A.
W71-06062

DIRECTORY OF PERSONNEL, WATER RESOURCES, WESTERN NEW YORK.
State Univ. of New York, Buffalo. Great Lakes Lab.

State University College at Buffalo Great Lakes Laboratory Personnel Directory, Fourth Edition, 1970. 81 p.

Descriptors: *Water resources, *Personnel, *Professional personnel, *Documentation, *New York, Surface waters, Groundwater, Hydrology, Water conservation, Water policy, Water pollution, Water quality, Water resources development, Water supply, Water treatment, Water utilization, Water law, Planning, Irrigation, Navigation, Flood control, Manpower.
Identifiers: *Personnel directory (Water resources).

This directory has been prepared by the Great Lakes Laboratory to promote cooperation and coordination in aquatic resources among people and agencies in Western New York. The information in this directory has been separated into three divisions - subject index, personnel index and agency index. To find the individuals and agencies involved with a given aspect of water resources such as aquatic life or drainage, one should consult the subject index. One can find the addresses of such parties by referring to the agency index. The numbers following the names of personnel and agencies correspond with the categories in the subject index. The Subject Index includes agricultural runoff, aquatic ecology, aquatic life, data processing, drainage, economics, flood control, hydroelectric power, industrial effluents, industrial waste water treatment, instrumentation, irrigation, marine construction, navigation, physical limnology, pollutant analysis, recreation, sensing, sewage, shipping, shore erosion prevention, shorelines, systems analysis, thermal pollution, training, treatment plant construction, waste disposal, water chemistry, water quality control, water resources investigations, water resources planning, water supply, water law, and weather. (Woodard-USGS)
W71-06150

10. SCIENTIFIC AND TECHNICAL INFORMATION

INTERBASIN DIVERSION OF WATER: AN ANNOTATED BIBLIOGRAPHY,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 07C.

W71-06071

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS.
Franklin Inst. Research Labs., Philadelphia, Pa.
For primary bibliographic entry see Field 04C.
W71-06253

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS (FIRST QUARTERLY ISSUE).
Franklin Inst. Research Labs., Philadelphia, Pa.
For primary bibliographic entry see Field 04C.
W71-06254

RADIATION TREATMENT OF SEWAGE,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
For primary bibliographic entry see Field 05D.
W71-06271

SUBJECT INDEX

ABSORPTION
METABOLISM OF QUINALDINE(2-METHYL-QUINOLINE). UPTAKE AND EXCRETION BY NURSE SHARKS,
W71-06324 05C

ABSTRACTS
SIMULATION OF A WATER RESOURCE SYSTEM, FINAL REPORT,
W71-06066 05G

ACCESS ROUTES
COUNTY OF BECKER V SHEVLIN LAND CO (RIGHT TO CONNECT NAVIGABLE STREAMS WITH HIGHWAYS).
W71-06099 06E

ACCLIMATIZATION
LACTIC AND PYRUVIC ACID CHANGES IN BLUEGILL SUNFISH (LEPOMIS MACROCHIRUS RAFINESQUE) DURING GRADUAL HYPOXIA AT TWO ACCLIMATION TEMPERATURES (5 AND 20C),
W71-06320 05C

THE INFLUENCE OF ACCLIMATION TEMPERATURE ON THE LIPID COMPOSITION OF FISH GILL MITOCHONDRIA,
W71-06321 05C

ACCRETION(LEGAL ASPECTS)
BONE V MAY (RIPARIAN RIGHT TO ACCRETIONS WHERE FORMER RIPARIANS' LAND HAS ERODED).
W71-05952 06E

GEORGE W ARMBRUSTER, JR, INC V WILDWOOD (EFFECT OF BEACH EROSION AND ACCRETION UPTON TITLE TO RIPARIAN LAND).
W71-06195 06E

TALLASSEE POWER CO V CLARK (RIPARIAN RIGHTS IN RIVER BED AND IN FUTURE FLOOD WATERS AND ALLUVIAN).
W71-06305 06E

ACID MINE WATER
CARBONATE BONDING OF COAL REFUSE,
W71-06256 05G

ACTIVATED ALUMINA
PHOSPHATE REMOVAL FORM TERTIARY EFFLUENT WITH ION EXCHANGE MATERIALS,
W71-05926 05D

ACTIVATED SLUDGE
FILAMENTOUS MICROORGANISMS AND THE BULKING OF ACTIVATED SLUDGE,
W71-06028 05D

SHEARING EFFECTS ON SETTLING OF ACTIVATED SLUDGE,
W71-06029 05D

PROCESS OPTIMA IN ACTIVATED SLUDGE,
W71-06032 05D

SOME EFFECTS OF HIGH SALT CONCENTRATIONS ON ACTIVATED SLUDGE,
W71-06034 05D

CASE HISTORIES IMPROVED ACTIVATED SLUDGE PLANT PERFORMANCE BY OPERATIONS CONTROL,
W71-06201 05D

ACTIVATED SLUDGE PROCESS
SETTLING CHARACTERISTICS OF ACTIVATED SLUDGE AT LOW TEMPERATURE,
W71-06107 05D

ADDITIVES
INCREASING SEWAGE FLOW VELOCITY BY USING CHEMICAL ADDITIVES,
W71-06400 08B

ADMINISTRATIVE AGENCIES
THE CONSERVANCY DISTRICT LAW (OUTLINE AND TEXT OF OHIO CONSERVANCY DISTRICT LAW).
W71-06046 06E

NAVIGATION AND NAVIGABLE WATERS,
W71-06049 06E

OYSTERS AND CLAMS (STATUTES GOVERNING TAKING OF OYSTERS AND CLAMS).
W71-06050 06E

CONTROL OF RELEASES OF RADIOACTIVITY TO THE ENVIRONMENT.
W71-06051 05G

THE ENFORCEMENT PHASE OF POLLUTION ABATEMENT THE ROLE OF THE ARMY ENGINEERS,
W71-06055 05G

DASHNER V WOODS BROS CONST CO (IMPLEMENTATION OF RIVER PROTECTION PROJECT).
W71-06087 06E

APPALACHIAN ELECTRIC POWER CO V SMITH (FEDERAL POWER COMMISSION'S POWER TO REGULATE PROJECTS ON NON-NAVIGABLE RIVERS).
W71-06183 06E

WATER, WATER EVERYWHERE---BUT A STUDY OF THE POLITICO-ADMINISTRATIVE ASPECTS OF WATER DEVELOPMENT IN MONTANA,
W71-06226 06E

HEARING BY DELAWARE RIVER BASIN COMM'N TO EXPAND THE COMPREHENSIVE PLAN.
W71-06275 05G

CERTIFICATES OF FINANCIAL RESPONSIBILITY (OIL POLLUTION).
W71-06276 06E

STATE WATER CONTROL LAW.
W71-06277 06E

STATE BOARD OF HEALTH (DISPOSAL OF SEWAGE AND SOLID WASTES).
W71-06278 06E

WATER AND WASTE WATER WORKS OPERATIONS (CERTIFICATION OF WATER AND WASTE WATER OPERATIONS).
W71-06279 06E

ADMINISTRATIVE DECISIONS
CERTIFICATES OF FINANCIAL RESPONSIBILITY (OIL POLLUTION).
W71-06276 06E

ADMINISTRATIVE PROBLEMS
WATER, WATER EVERYWHERE---BUT A STUDY OF THE POLITICO-ADMINISTRATIVE ASPECTS OF WATER DEVELOPMENT IN MONTANA,
W71-06226 06E

ADMINISTRATIVE REGULATIONS
CONTROL OF RELEASES OF RADIOACTIVITY TO THE ENVIRONMENT.
W71-06051 05G

AEOLIAN SOILS
DEFORMATION OF LEE-SIDE LAMINAE IN EOLIAN DUNES,
W71-05845 02J

AERATION
FUNDAMENTAL ASPECTS OF SURFACE AERATOR PERFORMANCE AND DESIGN,
W71-06030 05D

PROCESS OPTIMA IN ACTIVATED SLUDGE,
W71-06032 05D

DEVELOPMENT OF DESIGN PARAMETERS FOR INTERSTATE REST AREA SEWAGE TREATMENT SYSTEMS,
W71-06040 05D

INDUCED AIR MIXING OF LARGE BODIES OF POLLUTED WATER,
W71-06245 05G

INDUCED HYPOLIMNION AERATION FOR WATER QUALITY IMPROVEMENT OF POWER RELEASES,
W71-06251 05G

AERIAL PHOTOGRAPHY
HYDROLOGY OF LIMESTONE TERRANES, PHOTOGEOLOGIC INVESTIGATIONS,
W71-05838 02F

AERIAL PHOTOGRAPHIC TRACING OF PULP MILL EFFLUENT IN MARINE WATERS,
W71-06258 05B

AEROBIC CONDITIONS
TREATMENT OF ORGANIC INDUSTRIAL WASTES BY LAGOONING,
W71-06036 05D

AEROBIC TREATMENT
EVALUATION OF SOME STABILIZATION PONDS IN INDIA,
W71-06033 05D

AGGLOMERATION
SHEARING EFFECTS ON SETTLING OF ACTIVATED SLUDGE,
W71-06029 05D

AGGREGATES
CALCAREOUS PIPE FOR SEWERS,
W71-06407 08F

AGRICULTURAL DRAINAGE
EFFECTS OF AGRICULTURAL POLLUTION ON EUTROPHICATION,
W71-06443 05C

AGRICULTURE
POLLUTION - ARE FERTILIZERS AT FAULT,
W71-05996 05B

AGROCLIMATOLOGY
A COMPARISON OF WATER USE FOR HYBRID CORN IN THE BEKAA AND THE COASTAL PLAIN,
W71-06067 03F

AIR ENTRAINMENT
INDUCED AIR MIXING OF LARGE BODIES OF POLLUTED WATER,
W71-06245 05G

AIR POLLUTION
ENVIRONMENTAL QUALITY MANAGEMENT,
W71-05941 06B

AIRPORTS
JAMAICA BAY AND KENNEDY AIRPORT A MULTIDISCIPLINARY ENVIRONMENTAL STUDY.
W71-06045 06G

WATER QUALITY AT THE DADE-COLLIER TRAINING AND TRANSITION AIRPORT, MIAMI INTERNATIONAL AIRPORT, AND COTTONMOUTH CAMP-EVERGLADES NATIONAL PARK, FLORIDA, NOVEMBER, 1969,
W71-06158 05A

AIR-TESTING
LOW-PRESSURE AIR TESTS FOR SEWER LINES,
W71-06299 08A

ALABAMA
HYDROLOGY OF LIMESTONE TERRANES, PHOTOGEOLOGIC INVESTIGATIONS,
W71-05838 02F

FLOOD PLAIN INFORMATION, ELBA, ALABAMA, PEA RIVER, WHITE WATER AND BEAVER DAM CREEKS.
W71-05867 04A

ALDRIN
ALDRIN REMOVAL FROM LAKE WATER BY FLOCCULENT BACTERIA,
W71-06000 05G

CHEMISTRY AND METABOLISM OF INSECTICIDES,
W71-06438 05C

ALGAE
TOXICITY OF ZINC, COPPER AND LEAD TO CHLOROPHYTA FROM FLOWING WATERS,
W71-05991 05C

ENVIRONMENTALLY-INDUCED CHANGES IN THE FATTY ACIDS OF CHLORELLA,
W71-05992 02I

INVESTIGATIONS OF THE TECHNIQUES OF PURIFICATION OF ALGAL CULTURES ELABORATION OF METHODS APPLICABLE TO DESMIDS, FILAMENTOUS CYANOPHYTES, AND DIATOMS, (IN FRENCH),
W71-06002 07B

ALGAECIDAL EVALUATION AND ENVIRONMENTAL STUDY OF MAT PRODUCING BLUEGREEN ALGAE,
W71-06102 04A

CANAL CAPACITY STUDIES MAIN CANAL COLUMBIA BASIN PROJECT,
W71-06109 04A

ALGICIDES,
W71-06189 05C

ALGAE CULTURE TECHNIQUE
ALGAECIDAL EVALUATION AND ENVIRONMENTAL STUDY OF MAT PRODUCING BLUEGREEN ALGAE,
W71-06102 04A

ALGAL CONTROL
ALGICIDES,
W71-06189 05C

DEVELOPMENT OF PHOSPHATE-FREE HOME LAUNDRY DETERGENTS,
W71-06247 05G

ALGAL TOXINS
ALGAL TOXINS,
W71-05999 02I

ALGICIDES
ALGAECIDAL EVALUATION AND ENVIRONMENTAL STUDY OF MAT PRODUCING BLUEGREEN ALGAE,
W71-06102 04A

ALGICIDES,
W71-06189 05C

ALKALINE EARTH METALS
ION-SELECTIVE ELECTROCHEMICAL SENSORS - SECOND REPORT,
W71-06240 03A

ALKYLBENZENE SULFONATES
EFFECTS OF ALKYL BENZENE SULFONATE ON RAINBOW TROUT,
W71-06325 05C

ALLOCATION
AN ECONOMIC ANALYSIS OF THE INTERTEMPORAL ALLOCATION OF GROUNDWATER IN THE CENTRAL OGALLALA FORMATION,
W71-06266 04B

ALLOCATIVE EFFICIENCY
COLLECTIVE ACTION AND THE DISTRIBUTION OF INCOME A CONCEPTUAL APPROACH,
W71-05960 06C

ALLUVIAL CHANNELS
HYDRODYNAMIC EFFECTS OF SEEPAGE ON BED PARTICLES,
W71-05839 02J

FLAT-VEE WEIRS IN ALLUVIAL CHANNELS,
W71-05849 08B

ALTERATION OF FLOW
DRAINAGE DIST NO 7 V HAVERSTICK (LIABILITY FOR DIVERSION OF NATURAL WATERCOURSE).
W71-05876 06E

ALUMINUM
ANGLESEY ALUMINUM SEA OUTFALL,
W71-06289 08A

ALUMINUM PIPELINE FOR SEA OUTFALL SEWER.
W71-06355 08G

ALUMINUM ALLOYS
IMPROVEMENT OF THE CORROSION RESISTANCE OF ALUMINUM BRASS FOR USE IN SEA WATER CONVERSION PLANTS,
W71-06234 08G

ALUMINUM OXIDE
IMPROVEMENT OF THE CORROSION RESISTANCE OF ALUMINUM BRASS FOR USE IN SEA WATER CONVERSION PLANTS,
W71-06234 08G

AMERICAN WATER WORKS ASSOCIATION
75 YEARS OF IMPROVEMENT IN WATER SUPPLY QUALITY,
W71-05943 06E

AMINO ACIDS
NITROGEN AND AMINO ACIDS IN THE FECES OF YOUNG PIGS RECEIVING A PROTEIN-FREE DIET AND DIETS CONTAINING GRADED LEVELS OF SOYBEAN OIL MEAL OR CASEIN,
W71-06451 05B

AMMONIA
UREA CONVERSION TO AMMONIA IN WATERLOGGED SOILS,
W71-05866 02K

TREATMENT OF FISH HATCHERY EFFLUENT FOR RECYCLE,
W71-06024 05D

AMMONIA VOLATILIZATION
UREA CONVERSION TO AMMONIA IN WATERLOGGED SOILS,
W71-05866 02K

AMMONIUM COMPOUNDS
CHEMISTRY OF NITROGEN IN SOILS,
W71-06436 05B

AMPHIPODA
THE EFFECTS OF THE HERBICIDES DIQUAT AND DICHLOBENIL (CASORON) ON POND INVERTEBRATES PART I. ACUTE TOXICITY,
W71-06181 05C

ANACOSTIA RIVER
STORAGE BLADDERS FOR SEWAGE.
W71-06344 05G

ANAEROBIC BACTERIA
POLLUTION, BY BIOSYNTHESIS 'IN SITU' OF CARCINOGENOUS HYDROCARBONS, OF A LAGOON BIOCENOSIS 'IN VITRO' REPRODUCTION OF THIS PHENOMENON (IN FRENCH),
W71-06209 05B

ANAEROBIC CONDITIONS
EVALUATION OF SOME STABILIZATION PONDS IN INDIA,
W71-06033 05D

TREATMENT OF ORGANIC INDUSTRIAL WASTES BY LAGOONING,
W71-06036 05D

ANAEROBIC DIGESTION
ANAEROBIC DECOMPOSITION OF SWINE EXCREMENT,
W71-06453 05D

ANALYSIS
CANAL CAPACITY STUDIES MAIN CANAL COLUMBIA BASIN PROJECT,
W71-06109 04A

VELOCITY MEASUREMENTS IN SEWERS VITAL TO DESIGN AND MAINTENANCE,
W71-06394 08B

ANALYTIC TECHNIQUES
SIMULATION OF RUNOFF FROM URBAN WATERSHEDS,
W71-06306 04C

ANALYTICAL TECHNIQUES
ION-SELECTIVE ELECTROCHEMICAL SENSORS,
W71-06239 03A

ION-SELECTIVE ELECTROCHEMICAL SENSORS - SECOND REPORT,
W71-06240 03A

CHARACTERIZATION AND CONTROL OF COMBINED SEWER OVERFLOWS, SAN FRANCISCO,
W71-06326 08B

ANCHORAGES
NAVIGATION AND NAVIGABLE WATERS,
W71-06049 06E

ANIMAL MANURE
EFFECT OF SOIL TEMPERATURE ON THE AVAILABILITY OF PHOSPHORUS IN ANIMAL MANURES,
W71-06455 05C

ANIMAL METABOLISM
LACTIC AND PYRUVIC ACID CHANGES IN BLUEGILL SUNFISH (LEPOMIS MACROCHIRUS RAFINESQUE) DURING GRADUAL HYPOXIA AT TWO ACCLIMATION TEMPERATURES (5 AND 20C),
W71-06320 05C

ANION EXCHANGE RESINS
PHOSPHATE REMOVAL FORM TERTIARY EFFLUENT WITH ION EXCHANGE MATERIALS,
W71-05926 05D

ANNULAR PIPES
TURBULENT FRICTION IN ECCENTRIC ANNULAR CONDUITS,
W71-06402 08B

ANTARCTIC
THE ORIGIN OF THE LABYRINTH, WRIGHT VALLEY, ANTARCTICA,
W71-05847 02J

ANTIMYCIN-A
SOME EFFECTS OF ANTIMYCIN IN AN OLIGOTROPHIC LAKE,
W71-06323 05C

APPALACHIA
WATER USE BY APPALACHIAN MANUFACTURERS,
W71-06319 06D

APPLICATION METHODS
HOW TO SELECT AND APPLY ZINC FERTILIZER,
W71-06059 03F

SEED TABLETS FOR PRECISION PLANTING LETTUCE,
W71-06224 03F

LASER BEAM AND POWDER-ACTUATED TOOL SPEED PIPE LAYING.
W71-06354 08C

ALTERNATIVES TO SEPARATION OF COMBINED SEWERS,
W71-06374 05D

AQUACULTURE
SANITARY CONTROL OF SHELLFISH IN KOREA,
W71-06110 02L

AQUATIC ENVIRONMENT
PROBLEMS IN DISPOSAL OF WAST HEAT FROM STEAM-ELECTRIC PLANTS.
W71-05931 08A

AQUATIC INSECTS
THE EFFECTS OF THE HERBICIDES DIQUAT AND DICHLOBENIL (CASORON) ON POND INVERTEBRATES PART I. ACUTE TOXICITY,
W71-06181 05C

AQUATIC LIFE
THERMAL POLLUTION, AQUACULTURE AND PATHOBIOLOGY IN AQUATIC SYSTEMS,
W71-06092 05C

THE OCCURRENCE OF POLYCYCLIC AROMATIC CARBOHYDRATES IN COASTAL WATERS AND ITS POSSIBLE EFFECTS ON MAN'S HEALTH (IN GERMAN),
W71-06207 05C

AQUATIC MICROORGANISMS
POWER PLANTS EFFECTS OF CHLORINATION ON ESTUARINE PRIMARY PRODUCTION,
W71-06097 05C

AQUATIC WEED CONTROL
PHYSICAL PROPERTIES AND PROCESSING CHARACTERISTICS OF MACROPHYTES AS RELATED TO MECHANICAL HARVESTING,
W71-06188 04A

HERBICIDE RESIDUES IN AGRICULTURAL WATER FROM CONTROL OF AQUATIC AND BANK WEEDS,
W71-06440 05B

AQUATIC WEEDS
ALGAECIDAL EVALUATION AND ENVIRONMENTAL STUDY OF MAT PRODUCING BLUEGREEN ALGAE,
W71-06102 04A

AQUIFER
SEEPAGE FACE EFFECTS IN UNSTEADY GROUNDWATER FLOW,
W71-06190 02F

AQUIFERS
RECONNAISSANCE INVESTIGATION OF THE SUBSIDENCE OF VENICE AND SUGGESTED STEPS TOWARD ITS CONTROL,
W71-05870 02F

COMPUTER METHODS FOR TRANSIENT ANALYSIS OF WATER-TABLE AQUIFERS,
W71-05920 02F

ARCTIC REGIONS
A STUDY OF THE BEHAVIOR OF OIL SPILLS IN THE ARCTIC,
W71-06101 05B

SETTLING CHARACTERISTICS OF ACTIVATED SLUDGE AT LOW TEMPERATURE,
W71-06107 05D

A RATIONAL APPROACH TO THE DESIGN OF AERATED SEWAGE LAGOONS,
W71-06267 05D

ARID CLIMATES
PROBLEMS OF POLLUTION OF IRRIGATION WATERS IN ARID REGIONS,
W71-06112 05B

ARID LANDS
THE WOODSMAN'S ASSAULTS ON THE DOMAIN OF THE CATTLEMAN,
W71-06072 03F

WATER QUALITY MANAGEMENT PROBLEMS IN ARID REGIONS.
W71-06111 05G

NATURAL POLLUTION IN ARID LAND WATERS,
W71-06113 05B

ARIZONA
OPERATIONS RESEARCH STUDY OF WATER RESOURCES - PART II,
W71-06307 06A

ARKANSAS
MCGEHEE V WILLIAMS (CONTRACT BETWEEN CITIES FOR PROVISION OF WATER).
W71-05836 06E

DRAINAGE DIST NO 7 V HAVERSTICK (LIABILITY FOR DIVERSION OF NATURAL WATERCOURSE).
W71-05876 06E

WELL RECORDS, DEPTH-TO-WATER MEASUREMENTS, CHEMICAL ANALYSES OF GROUND WATER, DRILLERS LOGS, AND ELECTRIC-LOG INFORMATION IN HEMPSTEAD, LAFAYETTE, LITTLE RIVER, MILLER, AND NEVADA COUNTIES, ARKANSAS,
W71-06229 04B

ARTESIAN WELLS
SALINE ARTESIAN WATER AS A SUPPLEMENT,
W71-06124 03C

ARTHROPODS
INFLUENCE OF INDUSTRIAL EFFLUENTS ON ARTHROPODS OF THE MARINE SUPRALITTORAL ZONE, (IN GERMAN),
W71-06003 05C

ARTIFICIAL PRECIPITATION
OPPORTUNITIES FOR MODIFYING WEATHER TO AUGMENT PRECIPITATION AND SUPPRESS HAIL,
W71-06132 03B

ARTIFICIAL RECHARGE
ARTIFICIAL RECHARGE PRACTICES IN HAWAII,
W71-06263 04B

ASBESTOS PANEL METHOD
POSSIBILITY OF STUDYING THE EFFECTS OF POLLUTION ON BENTHIC ORGANISMS EMPLOYING IMMERSED PANELS (IN FRENCH),
W71-06205 05C

ASBESTOS-CEMENT PIPING
SEWER IMPROVEMENTS CALL FOR TRUNK.
W71-06353 08F

ASPHALT
CHARACTERIZATION OF OIL SLICKS ON SURFACE WATERS,
W71-06261 05A

ASTERIONELLA NOTATA
ANTIBACTERIAL ACTIVITY OF A MARINE DIATOM ASTERIONELLA NOTATA (GRUN) (IN FRENCH),
W71-06211 05C

ATTITUDES
SOCIO-CULTURAL IMPACTS OF WATER RESOURCE DEVELOPMENT IN THE SANTIAM RIVER BASIN,
W71-05921 06B

AUSTIN
TV INSPECTION AND IN-PLACE GROUTING OF SEWERS,
W71-06427 07B

AUSTRALIA
WATERFRONT LAND USE IN THE AUSTRALIAN STATE CAPITALS,
W71-06065 06B

STORM WATER RETARDING BASINS SOLVE URBAN DRAINAGE PROBLEMS,
W71-06364 05G

INFILTRATION IN SEWERS,
W71-06403 08A

BACKFILL
SCAPER PRODUCTION SPEEDS PIPE TRENCHING AT LOWER COSTS,
W71-06287 08C

BACKWATER
JACOBS V UNITED STATES (COMPENSATION FOR LAND RENDERED MORE SUSCEPTIBLE TO OVERFLOW).
W71-06296 06E

BACTERIA
CONDITIONS AFFECTING THE REDUCTION OF IRON AND MANGANESE BY BACTERIA IN THE ORE-BEARING LAKES OF THE KARELIAN ISTHMUS,
W71-05993 02K

ECOLOGY OF SELECTED BACTERIA IN A SMALL INTERMITTENT SEWAGE POND,
W71-05995 05D

ALDRIN REMOVAL FROM LAKE WATER BY FLOCCULENT BACTERIA,
W71-06000 05G

STUDY OF THE INFLUENCE OF BDELLORIBRIO BACTERIOROUS IN MARINE SELF-PURIFICATION (IN FRENCH),
W71-06204 05C

BADGER MAJOR
TRENCHLESS PIPELAYING DEMONSTRATED.
W71-06358 08C

BAFFLES
PROCESS OPTIMA IN ACTIVATED SLUDGE,
W71-06032 05D

BALANCE OF NATURE
THE ECOLOGY AND OCEANOGRAPHY OF SEWER OUTFALLS,
W71-05928 06G

BANGKOK(THAILAND)
DEVELOPMENT OF WATER RESOURCES IN ASIA AND THE FAR EAST-REPORT OF THE NINTH SESSION OF THE BIENNIAL REGIONAL CONFERENCE ON WATER RESOURCES DEVELOPMENT.
W71-05864 06B

BAYGON
A POTENTIAL CONTROL FOR LEECHES,
W71-06322 05C

BAYS
SUMMER THERMAL STRUCTURE AND CIRCULATION OF CHEQUAMEGON BAY, LAKE SUPERIOR--A FLUCTUATING SYSTEM,

W71-05885 02H

JAMAICA BAY AND KENNEDY AIRPORT A MULTIDISCIPLINARY ENVIRONMENTAL STUDY.
W71-06045 06G

METHOD OF AND MEANS FOR DEALING WITH STORM-WATER OVERFLOWS IN SEWERS AND LIKE DRAINAGE SYSTEMS,
W71-06375 08B

BAYTEX
A POTENTIAL CONTROL FOR LEECHES,
W71-06322 05C

BEACH DECONTAMINATION
A FEASIBILITY ANALYSIS OF INCINERATOR SYSTEMS FOR RESTORATION OF OIL CONTAMINATED BEACHES,
W71-06252 05E

BEACH EROSION
FLOOD PLAIN INFORMATION, ONTONAGON RIVER, ONTONAGON, MICHIGAN, AND LAKE SUPERIOR SHORELINE, ONTONAGON COUNTY, MICHIGAN.
W71-06232 04A

BEACHES
A FEASIBILITY ANALYSIS OF INCINERATOR SYSTEMS FOR RESTORATION OF OIL CONTAMINATED BEACHES,
W71-06252 05E

BEAR RIVER
WATER RELATED LAND USE IN THE BEAR RIVER DRAINAGE AREA,
W71-06212 07C

BED LOAD
THE MATTHES ROLLING DIAMETER AS AN INDICATOR OF CHANNEL STABILITY,
W71-06169 02J

BEDDING MATERIAL
WINNER 3.6 UNDER ON CALIFORNIA STORM DRAIN.
W71-06340 08F

BEEF FEEDING INDUSTRY
IMPLICATIONS OF WATER QUALITY LAWS FOR THE FEEDLOT INDUSTRY,
W71-06222 05G

BELGIUM
DESIGN OF SUB-SURFACE DRAINAGE SYSTEM FOR INNER RING ROAD OF CITY OF ANTIWERP,
W71-06391 08B

BENEFICIAL USE
USE ANIMAL MANURE EFFECTIVELY,
W71-06454 05D

BENTHOS
BENTHIC PRODUCTIVITY,
W71-06020 02L

STUDIES ON ULVA AND OTHER BENTHONIC MARINE ALGAE RECEIVING TREATED SEWAGE IN PONDS AND IN CALICO CREEK AT MOREHEAD CITY, NORTH CAROLINA,
W71-06021 02L

POSSIBILITY OF STUDYING THE EFFECTS OF POLLUTION ON BENTHIC ORGANISMS EMPLOYING IMMERSED PANELS (IN FRENCH),
W71-06205 05C

BETH-CU-LOY
GALVANIZED BETH-CU-LOY STEEL SHEETS - FOR CULVERT PIPE AND UNDERDRAINS.
W71-06419 08G

BIBLIOGRAPHIES
INTERBASIN DIVERSION OF WATER AN ANNOTATED BIBLIOGRAPHY,
W71-06071 07C

RADIATION TREATMENT OF SEWAGE,
W71-06271 05D

BIDS
FIBERGLASS WINS PIPELINE,
W71-06300 08G

WINNER 3.6 UNDER ON CALIFORNIA STORM DRAIN.
W71-06340 08F

BINDERS
CARBONATE BONDING OF COAL REFUSE,
W71-06256 05G

BIOASSAY
EFFECTS OF PH ON THE LIFE CYCLE OF THE MIDGE TANYTARSUS DISSIMILIS,
W71-05982 05C

BIOLOGICAL CONCEPTS AND INDUSTRIAL WASTE DISPOSAL PROBLEMS,
W71-06038 05D

THE EFFECTS OF THE HERBICIDES DIQUAT AND DICHLOBENIL (CASORON) ON POND INVERTEBRATES PART I. ACUTE TOXICITY,
W71-06181 05C

SOME FACTORS INFLUENCING TOXICITY OF LINEAR ALKYLATE SULFONATE (LAS) TO THE BLUEGILL,
W71-06260 05C

A POTENTIAL CONTROL FOR LEECHES,
W71-06322 05C

EFFECTS OF ALKYL BENZENE SULFONATE ON RAINBOW TROUT,
W71-06325 05C

BIOCHEMISTRY
THE INFLUENCE OF ACCLIMATION TEMPERATURE ON THE LIPID COMPOSITION OF FISH GILL MITOCHONDRIA,
W71-06321 05C

BIOCONTROL
WATER POLLUTION CONTROL. 5 BILLION DOLLARS TAB,
W71-06297 05G

BIODEGRADATION
DETERMINATION OF THE BIODEGRADABILITY OF ANIONIC SYNTHETIC SURFACE ACTIVE AGENTS.
W71-05990 05D

PORT ELGIN'S OXIDATION DITCH,
W71-06027 05D

THE EFFECT OF CLAY MINERALS ON SURFACTANT BIODEGRADABILITY,
W71-06196 05D

ANTIBACTERIAL SUBSTANCES PRODUCED BY MARINE BACTERIA (IN FRENCH),
W71-06203 05C

BIOLOGICAL COMMUNITIES
STUDIES OF MARINE ESTUARINE ECOSYSTEMS DEVELOPING WITH TREATED SEWAGE WASTES,
W71-06012 02L

BIOTOXINS
ALGAL TOXINS,
W71-05999 02I

BLACK RIVER BASIN(MICH)
WATER RESOURCES OF THE BLACK RIVER BASIN, SOUTHEASTERN MICHIGAN,
W71-05869 07C

BLUEGILL
SOME FACTORS INFLUENCING TOXICITY OF LINEAR ALKYLATE SULFONATE (LAS) TO THE BLUEGILL,
W71-06260 05C

BOLL SHEDDING
PHYSIOLOGY OF BOLL SHEDDING IN COTTON IV. CORRELATION STUDIES ON FLOWER PRODUCTION AND BOLL SHEDDING IN RELATION TO TEMPERATURE AND RAINFALL,
W71-06056 03F

BOREHOLE CAMERAS
FORMATION EVALUATION BY INSPECTION WITH THE BOREHOLE TELEVIEWER,
W71-05916 07B

BOREHOLE GEOPHYSICS
FORMATION EVALUATION BY INSPECTION WITH THE BOREHOLE TELEVIEWER,
W71-05916 07B

BOREHOLES
FORMATION EVALUATION BY INSPECTION WITH THE BOREHOLE TELEVIEWER,
W71-05916 07B

BOTTOM SAMPLING
MONTHLY VARIATION IN PHOSPHATE AND RELATED CHEMICALS FOUND IN THE SEDIMENT IN THE ISLAND AREA OF LAKE ERIE, 1967-68, WITH REFERENCE TO SAMPLES COLLECTED IN 1964, 1965, AND 1966,
W71-06187 05B

BOTTOM SEDIMENT SAMPLING
BOTTOM SEDIMENT SAMPLING,
W71-05886 07B

BOTTOM SEDIMENTS
WATER CHEMISTRY OF TOXAPHENE - ROLE OF LAKE SEDIMENTS,
W71-05840 05B

BOTTOM SEDIMENT SAMPLING,
W71-05886 07B

THE QUALITATIVE DISTRIBUTION OF FELDSPARS IN SURFICIAL BOTTOM SEDIMENTS FROM LAKE ONTARIO,
W71-05889 02J

GEOLOGICAL, CHEMICAL, AND PHYSICAL ATTRIBUTES OF SEDIMENTS IN SENECA LAKE, NEW YORK,
W71-05890 02J

CHEMICAL CHARACTERIZATION OF BOTTOM SEDIMENTS,
W71-05981 05A

BOUNDARIES(PROPERTY)
BONE V MAY (RIPARIAN RIGHT TO ACCRETIONS WHERE FORMER RIPARIANS' LAND HAS ERODED).
W71-05952 06E

STATE V MOUNTS (BOUNDARIES ON NON-NAVIGABLE STREAMS WHERE SURVEY DIFFERS FROM NATURAL MONUMENTS).
W71-06007 06E

HOGUE V STRICKER LAND AND TIMBER CO (NAVIGABLE RIVER AS BOUNDARY BETWEEN STATES).
W71-06178 06E

BOUNDARY DISPUTES
UNION SAND AND GRAVEL CO V NORTHCOTT (TITLE TO LAND BETWEEN HIGH AND LOW WATER MARKS).

W71-05979 06E

STATE V MOUNTS (BOUNDARIES ON NON-NAVIGABLE STREAMS WHERE SURVEY DIFFERS FROM NATURAL MONUMENTS).
W71-06007 06E

MILLER V COMMONWEALTH (TITLE TO VIRGINIA TIDAL MARSHES).
W71-06161 06E

STATE OF NEW JERSEY V STATE OF DELAWARE (LOCATION OF DELAWARE RIVER BOUNDARY BETWEEN NEW JERSEY AND DELAWARE).
W71-06172 06E

UNITED STATES V HAYES (TITLE TO STREAMBED FORMERLY PART OF INDIAN RESERVATION).
W71-06177 06E

HOGUE V STRICKER LAND AND TIMBER CO (NAVIGABLE RIVER AS BOUNDARY BETWEEN STATES).
W71-06178 06E

OUNDARY LAYERS
BOUNDARY LAYER FLOW PROBLEMS IN DESALINATION BY REVERSE OSMOSIS,
W71-06237 03A

RACKISH WATER
MOLLUSCAN STUDIES,
W71-06015 02L

CARBON,
W71-06017 02L

PHOSPHORUS FLUX BETWEEN WATER AND PLANKTON A PRELIMINARY REPORT,
W71-06018 02L

PHYTOPLANKTON POPULATIONS A PRELIMINARY REPORT,
W71-06022 02L

RINE
STUDY AND EXPERIMENTS IN WASTE WATER RECLAMATION BY REVERSE OSMOSIS,
W71-06025 05D

RINE DISPOSAL
ULTIMATE DISPOSAL OF INDUSTRIAL WASTE AN OVERVIEW,
W71-06259 05E

RINES
LIMNOLOGY OF ZUNI SALT LAKE, NEW MEXICO,
W71-05846 02H

RITISH COLUMBIA
USING ALL AVAILABLE HYDROLOGIC DATA,
W71-06138 07C

VARIATION OF GROUND SNOW LOADS IN BRITISH COLUMBIA,
W71-06140 02C

RULE BASIN(WIS)
THE UPLAND FOREST VEGETATION OF THE BOIS BRULE RIVER BASIN, TRIBUTARY TO LAKE SUPERIOR,
W71-05987 02J

RUSH CONTROL
WATER CONSERVATION BY REMOVAL OF PHREATOPHYTES,
W71-06154 03B

THE SAN SIMON WATERSHED REVEGETATION,
W71-06223 04D

PINYON-JUNIPER CONTROL WHERE. WHY,
W71-06225 04D

UDGETING
RESCUING POLICY ANALYSIS FROM PPBS,
W71-05968 06B

A NOTE ON BIASES IN CAPITAL BUDGETING INTRODUCED BY INFLATION,
W71-05969 06C

ULGARIA
DETERMINATION OF FLOOD FLOWS AND DISCHARGE COEFFICIENTS IN MUNICIPAL SEWERAGE SYSTEMS,
W71-06395 08B

ULKING
FILAMENTOUS MICROORGANISMS AND THE BULKING OF ACTIVATED SLUDGE,
W71-06028 05D

ULLHEADS
A PRELIMINARY STUDY OF THE FEEDING RELATIONSHIPS OF FISH IN A HARD-WATER AND A SOFT-WATER STREAM IN SOUTHERN ENGLAND,
W71-06327 05C

UREAU OF RECLAMATION
THE BUREAU OF RECLAMATION'S ROLE IN AMERICA'S GROWTH,
W71-06308 06E

YPASSES
THE WRAY FLOOD DISASTER AND ITS EFFECTS ON THE PUBLIC HEALTH SERVICES,
W71-06386 05F

ALCAREOUS SOILS
HOW TO SELECT AND APPLY ZINC FERTILIZER,
W71-06059 03F

CALCIUM CARBONATE
CARBONATE BONDING OF COAL REFUSE,
W71-06256 05G

CALICO CREEK(NC)
STUDIES OF MARINE ESTUARINE ECOSYSTEMS DEVELOPING WITH TREATED SEWAGE WASTES,
W71-06012 02L

FUNGAL SURVEY IN WASTE PONDS AND CREEK,
W71-06013 02L

CHARACTERISTICS OF SPARTINA MARSH WHICH IS RECEIVING TREATED MUNICIPAL SEWAGE WASTES,
W71-06014 02L

MOLLUSCAN STUDIES,
W71-06015 02L

CRUSTACEANS AND FISHES IN THE SEA GRANT PONDS,
W71-06016 02L

CARBON,
W71-06017 02L

PHOSPHORUS FLUX BETWEEN WATER AND PLANKTON A PRELIMINARY REPORT,
W71-06018 02L

THE USE OF CARBON-14 FOR THE STUDY OF THE UPTAKE AND UTILIZATION OF PHYTOPLANKTON BY RANGEA CUNEATA,
W71-06019 02L

BENTHIC PRODUCTIVITY,
W71-06020 02L

STUDIES ON ULVA AND OTHER BENTHONIC MARINE ALGAE RECEIVING TREATED SEWAGE IN PONDS AND IN CALICO CREEK AT MOREHEAD CITY, NORTH CAROLINA,
W71-06021 02L

PHYTOPLANKTON POPULATIONS A PRELIMINARY REPORT,
W71-06022 02L

FIRST YEAR RECORD OF TOTAL METABOLISM OF MARINE PONDS RECEIVING TREATED WASTES,
W71-06023 02L

CALIFORNIA
FLOOD PLAIN INFORMATION, CALLEGUAS CREEK, VICINITY OF MOORPARK, VENTURA COUNTY, CALIFORNIA.
W71-05868 04A

EDWARDS V ATCHISON, T AND S F RR (PRESCRIPTIVE RIGHT TO DISCHARGE WATER).
W71-05994 06E

SEVENTH BIENNIAL CONFERENCE ON GROUNDWATER (PROGRESS, PRACTICE, AND POTENTIAL OF GROUNDWATER RECHARGE, DEVELOPMENT AND MANAGEMENT).
W71-06117 04B

FLOODS FROM SMALL DRAINAGE AREAS IN CALIFORNIA-A COMPILATION OF PEAK DATA OCTOBER 1958 TO SEPTEMBER 1969,
W71-06127 07C

THE DEVELOPMENT AND APPLICATION OF A HYDROLOGIC MODEL AS AN OPERATIONAL TOOL,
W71-06135 02C

CAMBIUM
ENVIRONMENTAL EFFECTS ON WOOD PRODUCTION AND CAMBIAL ACTIVITY IN ZIZIPHUS SPINACHRISTI (L.) WILLD.,
W71-06214 02I

CANADA
ESTIMATES OF MONTHLY EVAPORATION LOSSES FROM THE GREAT LAKES 1950 TO 1968 BASED ON THE MASS TRANSFER TECHNIQUE,
W71-05892 02D

SNOW LOADS FOR THE DESIGN OF ROOFS IN CANADA,
W71-06143 08A

WORK STARTS ON 11-MILE INTERCEPTOR TO SOLVE TORONTO'S SEWER PROBLEM.
W71-06337 08A

A NEW TWIST (90 DEGREES IN FACT) TO SEGMENTED SEWER - PIPE DESIGN.
W71-06376 08A

CANAL SEEPAGE
COLONNA V STATE (DAMAGES FOR FLOODING OF QUARRY).
W71-06164 06E

CANALS
STATE V MIDDLETOWN HYDRAULIC CO (VALIDITY OF WATER RIGHTS RESERVATION IN GRANT OF CANAL PROPERTY TO STATE).
W71-06098 06E

CRAGE V CITY OF BUFFALO (DUTY OF CITY TO PROVIDE FOR SEWAGE DISPOSAL).
W71-06170 06E

KIRK V MAUMEE VALLEY ELECTRIC CO (LEASE OF WATER RIGHTS IN CANAL SUBJECT TO STATE'S RIGHT TO ABANDON CANAL).
W71-06171 06E

CANNERIES
WASTE REDUCTION IN FOOD CANNING OPERATIONS,
W71-06257 05D

CAPACITY
OVERFLOW STUDIES AT A SEWER SYSTEM OF A METROPOLITAN CITY,
W71-06373 08B

A RE-EXAMINATION OF THE STORM TANK PROBLEM,
W71-06377 05D

HYDRAULIC DESIGN OF SELF-CLEANING SEWAGE TUNNELS,
W71-06401 08B

EXPERIMENTAL ESTIMATION OF DETENTION IN STORM SEWER SYSTEM,
W71-06404 08B

W71-06404 08B

CAPITAL ALLOCATION
A NOTE ON BIASES IN CAPITAL BUDGETING INTRODUCED BY INFLATION,
W71-05969 06C

CAPITAL BUDGETING
INFORMATION FOR DECISION MAKING,
W71-05953 06B

UNCERTAINTY AND ITS EFFECT ON CAPITAL INVESTMENT ANALYSIS,
W71-05954 06B

CAPITAL COSTS
A NOTE ON BIASES IN CAPITAL BUDGETING INTRODUCED BY INFLATION,
W71-05969 06C

CARBON
CARBON,
W71-06017 02L

CARBON DIOXIDE
ENVIRONMENTALLY-INDUCED CHANGES IN THE FATTY ACIDS OF CHLORELLA,
W71-05992 02I

CARBONATE BONDING
CARBONATE BONDING OF COAL REFUSE,
W71-06256 05G

CARBONATE ROCKS
HYDROLOGY OF LIMESTONE TERRANES, PHOTOGEOLOGIC INVESTIGATIONS,
W71-05838 02F

CARCINOGENIC POLYCICLIC AROMATIC HYDROCARBONS
THE OCCURRENCE OF POLYCYCLIC AROMATIC CARBOHYDRATES IN COASTAL WATERS AND ITS POSSIBLE EFFECTS ON MAN'S HEALTH (IN GERMAN),
W71-06207 05C

CELLULAR EXTRACT
ANTIBACTERIAL ACTIVITY OF A MARINE DIATOM ASTERIONELLA NOTATA (GRUN) (IN FRENCH),
W71-06211 05C

CENSUS
WATER REQUIREMENTS FOR MANUFACTURING,
W71-06318 06D

CERTAINTY-EQUIVALENT VALUE
THE TREATMENT OF RISK AND UNCERTAINTY,
W71-05965 06B

CHANNEL FLOW
WIND-DRIVEN CURRENTS IN A LONG ROTATING CHANNEL,
W71-05904 02E

CHANNEL MORPHOLOGY
FLAT-VEE WEIRS IN ALLUVIAL CHANNELS,
W71-05849 08B

ON UNIFORM FLOW THROUGH SMOOTH RECTANGULAR OPEN CHANNELS,
W71-05863 08B

CHANNELS
DEPTH OF FLOW AS DESIGN CRITERION FOR CHANNELS WITH ARTIFICIAL LINERS,
W71-06399 08B

CHARLES COUNTY(MD)
AVAILABILITY OF GROUNDWATER IN CHARLES COUNTY, MARYLAND,
W71-06168 02F

CHEMICAL ADDITIVES
INCREASING SEWAGE FLOW VELOCITY BY USING CHEMICAL ADDITIVES,
W71-06400 08B

CHEMICAL ANALYSIS
GEOCHEMICAL SURVEY OF MISSOURI, PLANS AND PROGRESS FOR SECOND SIX-MONTH PERIOD (JANUARY-JUNE, 1970).
W71-05854 02K

CHEMICAL CHARACTERIZATION OF BOTTOM SEDIMENTS,
W71-05981 05A

EVALUATION OF AN AUTOMATIC CHEMICAL ANALYSIS MONITOR FOR WATER QUALITY PARAMETERS,
W71-06005 05A

METHODS FOR CHEMICAL ANALYSIS OF FRESH WATERS.
W71-06159 02K

CHEMICAL PROPERTIES
PRIMARY PRODUCTION AND CHEMICAL AND PHYSICAL CHARACTERISTICS OF LAKE ASHTABULA RESERVOIR, NORTH DAKOTA,
W71-06008 02H

CHEQUAMEGON BAY(LAKE SUPERIOR)
SUMMER THERMAL STRUCTURE AND CIRCULATION OF CHEQUAMEGON BAY, LAKE SUPERIOR--A FLUCTUATING SYSTEM,
W71-05885 02H

CHICAGO
PLANKTON REDUCTION IN THE REVERSED FLOW WATERWAYS OF THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO,
W71-05924 05B

CHICAGO(ILLINOIS)
NORTH SIDE TREATMENT PLANT CHLORINATION,
W71-05925 05D

CHLAMYDOMONAS
REACTION RATES OF PHOTOSYNTHESIS,
W71-06039 05C

CHLORELLA
ON THE OCCURRENCE OF TRANS-3-HEXADECANOIC ACID IN CHLORELLA CELLS, (IN RUSSIAN),
W71-05989 02K

ENVIRONMENTALLY-INDUCED CHANGES IN THE FATTY ACIDS OF CHLORELLA,
W71-05992 02I

CHLORINATED HYDROCARBON PESTICIDE
ALDRIN REMOVAL FROM LAKE WATER BY FLOCCULENT BACTERIA,
W71-06000 05G

CHLORINATED HYDROCARBON PESTICIDES
WATER CHEMISTRY OF TOXAPHENE - ROLE OF LAKE SEDIMENTS,
W71-05840 05B

CHLORINATION
NORTH SIDE TREATMENT PLANT CHLORINATION,
W71-05925 05D

POWER PLANTS EFFECTS OF CHLORINATION ON ESTUARINE PRIMARY PRODUCTION,
W71-06097 05C

STORM WATER TREATMENT AT CLEVELAND,
W71-06389 05D

CHLORINE DOSAGE
NORTH SIDE TREATMENT PLANT CHLORINATION,
W71-05925 05D

CHROMIUM
FOAM SEPARATION PROCESSES FROM INDUSTRIAL WASTE TREATMENT PHENOL, PHOSPHATE, AND HEXAVALENT CHROMIUM,
W71-06194 05D

CITIES
WATERFRONT LAND USE IN THE AUSTRALIAN STATE CAPITALS,
W71-06065 06B

BLACK V TOWN OF BESSEMER CITY (DAMAGE TO LAND BY SEWAGE PLANT).
W71-06086 06E

VENICE IS SINKING INTO THE SEA,
W71-06120 02F

CRAGE V CITY OF BUFFALO (DUTY OF CITY TO PROVIDE FOR SEWAGE DISPOSAL).
W71-06170 06E

GEORGE W ARMBRUSTER, JR, INC V WILDWOOD (EFFECT OF BEACH EROSION AND ACCRETION UPTON TITLE TO RIPARIAN LAND).
W71-06195 06E

A CRAZY IDEA ON URBAN WATER MANAGEMENT,
W71-06309 06B

ECONOMIC DESIGN OF CENTRAL WATER SUPPLY SYSTEMS FOR MEDIUM SIZED TOWNS,
W71-06312 06B

CLAMS
OYSTERS AND CLAMS (STATUTES GOVERNING TAKING OF OYSTERS AND CLAMS).
W71-06050 06E

HOWES V TOWN OF BARNSTABLE (OWNERSHIP OF CLAM BEDS).
W71-06089 06E

CLARIFICATION
SETTLING CHARACTERISTICS OF ACTIVATED SLUDGE AT LOW TEMPERATURE,
W71-06107 05D

CLAY MINERALS
GEOCHEMICAL SYSTEMS IN ONONDAGA LAKE (CENTRAL NEW YORK STATE) COMPARED WITH THE GREAT LAKES,
W71-05888 02H

CLAYS
THE EFFECT OF CLAY MINERALS ON SURFACTANT BIODEGRADABILITY,
W71-06196 05D

PREDICTION OF MOISTURE MOVEMENT IN EXPANSIVE CLAYS,
W71-06272 02G

CLEANING
A FEASIBILITY ANALYSIS OF INCINERATOR SYSTEMS FOR

RESTORATION OF OIL CONTAMINATED BEACHES,
W71-06252 05E

CLEVELAND
STORM WATER TREATMENT AT CLEVELAND,
W71-06389 05D

CLIMATOLOGY
PACIFIC OCEAN INFLUENCE UPON CALIFORNIA RAINFALL,
W71-06115 02B

CLOSED CONDUIT FLOW
ON UNIFORM FLOW THROUGH SMOOTH RECTANGULAR OPEN CHANNELS,
W71-05863 08B

CLOUD SEEDING
OPPORTUNITIES FOR MODIFYING WEATHER TO AUGMENT PRECIPITATION AND SUPPRESS HAIL,
W71-06132 03B

COAGULATION
FE CL3 ADDITION EXPERIMENTS FOR IMPROVED EFFLUENT QUALITY AT THE CALUMET TREATMENT PLANT, INTERIM REPORT,
W71-05927 05D

DEVELOPMENT OF NEUTRON ACTIVATION FOR INVESTIGATION OF WATER CLARIFICATION,
W71-06265 05D

COAL MINE WASTE
CARBONATE BONDING OF COAL REFUSE,
W71-06256 05G

COAL REFUSE BINDER
CARBONATE BONDING OF COAL REFUSE,
W71-06256 05G

COASTAL ENGINEERING
WAVE FORCES IN LAKE ERIE,
W71-05894 02H

COASTAL MARSHES
HOME REAL ESTATE LOAN AND INS CO V PARMELE (STATE MAY PASS TITLE TO NON-NAVIGABLE TIDAL WATERS).
W71-05980 06E

COLIFORMS
ECOLOGY OF SELECTED BACTERIA IN A SMALL INTERMITTENT SEWAGE POND,
W71-05995 05D

COLORADO
RADIOCHEMICAL ANALYSES OF WATER FROM SELECTED STREAMS, WELLS, SPRINGS, AND PRECIPITATION COLLECTED PRIOR TO REENTRY DRILLING, PROJECT RULISON,
W71-05842 05A

COLORADO SEMIDRAINAGE MOUNTAIN LAKES,
W71-06165 02H

COLORADO RIVER BASIN
OPPORTUNITIES FOR MODIFYING WEATHER TO AUGMENT PRECIPITATION AND SUPPRESS HAIL,
W71-06132 03B

THE SURFACE INSTRUMENT NETWORK OF THE UPPER COLORADO RIVER PILOT PROJECT,
W71-06136 07A

COLORADO RIVER DELTA(TEX)
FACIES AND DEVELOPMENT OF THE COLORADO RIVER DELTA IN TEXAS,
W71-05860 02J

COLUMBIA RIVER
SNOW AND RESERVOIR MANAGEMENT IN CANADA FOR THE COLUMBIA RIVER TREATY OPERATION,
W71-06134 02C

COLUMBIA RIVER TREATY
SNOW AND RESERVOIR MANAGEMENT IN CANADA FOR THE COLUMBIA RIVER TREATY OPERATION,
W71-06134 02C

COMBINED SEWERS
SELECTED URBAN STORM WATER RUNOFF ABSTRACTS.
W71-06253 04C

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS (FIRST QUARTERLY ISSUE).
W71-06254 04C

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS (SECOND QUARTERLY ISSUE).
W71-06255 04C

DESIGN EXAMPLES IN METRIC.
W71-06343 08A

CLEANING OUR ENVIRONMENT-THE CHEMICAL BASIS FOR ACTION SECTION 2 - THE WATER ENVIRONMENT MUNICIPAL WASTE WATER TREATMENT.
W71-06415 05D

NOTES ON WATER POLLUTION.
W71-06418 05G

PLASTIC RELINING OF SMALL-DIAMETER PIPES,
W71-06426 08G

COMPACTED SOILS
ENGINEERING BEHAVIOR AND STRUCTURE OF COMPACTED CLAY,
W71-05908 08D

COMPETITIVE EQUILIBRIUM
THE ORGANIZATION OF ECONOMIC ACTIVITY ISSUES PERTINENT TO THE CHOICE OF MARKET VERSUS NONMARKET ALLOCATION,
W71-05966 06C

COMPLEMENTARITY
THE DEMAND FOR LEISURE,
W71-05970 06D

COMPLETE MIXING
PROCESS MODELING OF BIOLOGICAL WASTE TREATMENT,
W71-06026 05D

COMPUTER APPLICATIONS
SETTLEMENT PROBLEM ORIENTED COMPUTER LANGUAGE,
W71-05915 08D

COMPUTER MODELS
OPTIMIZATION TECHNIQUES FOR WATER RESOURCE SYSTEMS,
W71-06062 06A

SIMULATION OF A WATER RESOURCE SYSTEM, FINAL REPORT,
W71-06066 05G

COMPUTER PROGRAMS
SETTLEMENT PROBLEM ORIENTED COMPUTER LANGUAGE,
W71-05915 08D

SIMULATION OF A WATER RESOURCE SYSTEM, FINAL REPORT,
W71-06066 05G

SELECTIVE WITHDRAWAL AT LAKE LIVINGSTON, PRELIMINARY EVALUATIONS, 1969,
W71-06193 05C

PROBLEM OF FLOOD-CONTROL IN SMALL BASINS,
W71-06298 07C

COMPUTERS IN HONG KONG PUBLIC WORKS,
W71-06423 05G

COMPUTERS
DISCUSSION OF THE USES OF ELECTRONIC PLOTTING IN GROUNDWATER ENGINEERING,
W71-05906 07C

COMPUTERS IN HONG KONG PUBLIC WORKS,
W71-06423 05G

CONCRETE ADDITIVES
REHABILITATION OF A CONCERT SEWER UNDER INFILTRATION PRESSURE,
W71-06294 08F

CONCRETE CONSTRUCTION
WINNER 3.6 UNDER ON CALIFORNIA STORM DRAIN.
W71-06340 08F

CONCRETE PIPES
SEWERS UNDER ATTACK,
W71-06301 08G

WINNER 3.6 UNDER ON CALIFORNIA STORM DRAIN.
W71-06340 08F

UNDERWATER LINE SPANS 32 FEET BETWEEN SUPPORTS.
W71-06362 08F

CALCAREOUS PIPE FOR SEWERS,
W71-06407 08F

CONDEMNATION
JACOBS V UNITED STATES (COMPENSATION FOR LAND RENDERED MORE SUSCEPTIBLE TO OVERFLOW).
W71-06296 06E

CONDENSERS
OAK RIDGE NATIONAL LABORATORY VERTICAL TUBE EVAPORATOR PILOT PLANT ANNUAL REPORT FOR FISCAL YEAR 1969.
W71-06243 03A

OAK RIDGE NATIONAL LABORATORY VERTICAL TUBE EVAPORATOR PILOT PLANT - ANNUAL REPORT FOR FISCAL YEAR 1970.
W71-06244 03A

CONFERENCES
DEVELOPMENT OF WATER RESOURCES IN ASIA AND THE FAR EAST-REPORT OF THE NINTH SESSION OF THE BIENNIAL REGIONAL CONFERENCE ON WATER RESOURCES DEVELOPMENT.
W71-05864 06B

WATER QUALITY MANAGEMENT PROBLEMS IN ARID REGIONS.
W71-06111 05G

SEVENTH BIENNIAL CONFERENCE ON GROUNDWATER (PROGRESS, PRACTICE, AND POTENTIAL OF GROUNDWATER RECHARGE, DEVELOPMENT AND MANAGEMENT).
W71-06117 04B

FRONTIERS IN CONSERVATION.
W71-06129 04C

WESTERN SNOW CONFERENCE.
W71-06133 02C

METHODS FOR CHEMICAL ANALYSIS OF FRESH WATERS.
W71-06159 02K

CONJUNCTIVE USE

POTENTIAL FOR STREAMFLOW AUGMENTATION BY GROUNDWATER PUMPING,
W71-06118 04B

CONNECTICUT
WATER POLLUTION OBSERVATIONS ON CONNECTICUT'S RESPONSE,
W71-06047 05G

CONNECTICUT WATER LAW JUDICIAL ALLOCATION OF WATER RESOURCES,
W71-06273 06E

CONSERVATION
FRONTIERS IN CONSERVATION.
W71-06129 04C

CONSOLIDATION
ENGINEERING BEHAVIOR AND STRUCTURE OF COMPACTED CLAY,
W71-05908 08D

CONSTITUTIONALITY
APPALACHIAN ELECTRIC POWER CO V SMITH (CONSTITUTIONALITY OF HYDROELECTRIC PROJECT LICENSING).
W71-05977 06E

COUNTY OF BECKER V SHEVLIN LAND CO (RIGHT TO CONNECT NAVIGABLE STREAMS WITH HIGHWAYS).
W71-06099 06E

COLGATE V PHILADELPHIA ELECTRIC POWER CO (CONSTITUTIONALITY OF CONDEMNATION OF PENNSYLVANIA LAND FOR OVERFLOW FROM MARYLAND DAM).
W71-06173 06E

CONSTRUCTION
ANGLESEY ALUMINUM SEA OUTFALL,
W71-06289 08A

WASHED-OUT PLATE CULVERT RESET IN 17-TON SECTIONS BY CRANE.
W71-06336 08A

WORK STARTS ON 11-MILE INTERCEPTOR TO SOLVE TORONTO'S SEWER PROBLEM.
W71-06337 08A

SEWERS UNDER ATTACK.
W71-06349 08G

MAIN DRAINAGE,
W71-06422 08A

STRUCTURES PREVENT URBAN SEDIMENT DAMAGE,
W71-06425 04D

CONSTRUCTION COSTS
RUBBER TANKS AID SEWAGE FIGHT,
W71-06290 05G

STORMWATER OVERFLOW GETS BAGGED.
W71-06341 05G

CONSTRUCTION EQUIPMENT
SCAPER PRODUCTION SPEEDS PIPE TRENCHING AT LOWER COSTS,
W71-06287 08C

TRENCHER AND BOX SHIELD MAKE SEWER JOB ALMOST ONE-RIG OPERATION.
W71-06334 08C

TOOLS OF THE BUILDER.
W71-06335 08C

PLASTIC FITTINGS SPEED LAYING OF SEWER PIPE.
W71-06338 08G

STORMWATER OVERFLOW GETS BAGGED.
W71-06341 05G

STORAGE BLADDERS FOR SEWAGE.
W71-06344 05G

PUBLIC WORKS EXHIBITION PREVIEW.
W71-06350 08G

LASER BEAM AND POWDER-ACTUATED TOOL SPEED PIPE LAYING.
W71-06354 08C

ALUMINUM PIPELINE FOR SEA OUTFALL SEWER.
W71-06355 08G

SUSPENDED SEWAGE PIPELINE.
W71-06356 08A

UNDERWATER LINE SPANS 32 FEET BETWEEN SUPPORTS.
W71-06362 08F

LETTERS TO THE EDITOR--WATCH OUT FOR CROSS CONNECTIONS,
W71-06381 05G

CORRUGATED STEEL PIPE STORM SEWERS.
W71-06420 08G

TANKS.
W71-06421 08G

CONSTRUCTION MATERIALS
PLASTICS IN WATER AND SEWAGE CONTROL,
W71-06286 08G

ANGLESEY ALUMINUM SEA OUTFALL,
W71-06289 08A

RUBBER TANKS AID SEWAGE FIGHT,
W71-06290 05G

STABILIZED BASE FOR RESIDENTIAL STREETS,
W71-06292 08F

SEWERS UNDER ATTACK,
W71-06301 08G

PLASTIC FITTINGS SPEED LAYING OF SEWER PIPE.
W71-06338 08G

WINNER 3.6 UNDER ON CALIFORNIA STORM DRAIN.
W71-06340 08F

REMOTE-CONTROL 'MINI-DAMS' GUARD MINNEAPOLIS SEWERS.
W71-06345 08A

INTERNATIONAL BUILDING EXHIBITION - OLYMPIA LONDON 13-25 NOVEMBER 1969.
W71-06348 08A

SEWERS UNDER ATTACK.
W71-06349 08G

PUBLIC WORKS EXHIBITION PREVIEW.
W71-06350 08G

COMBINED SEWER SOLUTION SOUGHT IN SANDUSKY FIELD DEMONSTRATION.
W71-06352 05G

SEWER IMPROVEMENTS CALL FOR TRUNK.
W71-06353 08F

ALUMINUM PIPELINE FOR SEA OUTFALL SEWER.
W71-06355 08G

STORM WATER STORAGE SCHEME.
W71-06357 05G

UNDERWATER SEWAGE STORAGE AN AID TO POLLUTION ABATEMENT.
W71-06361 05G

GALVANIZED BETH-CU-LOY STEEL SHEETS - FOR CULVERT PIPE AND UNDERDRAINS.
W71-06419 08G

CORRUGATED STEEL PIPE STORM SEWERS.
W71-06420 08G

TANKS.
W71-06421 08G

PLASTICS IN WATER AND SEWAGE CONTROL,
W71-06424 08G

CONSTRUCTION PROBLEMS
MAIN DRAINAGE,
W71-06422 08A

CONSUMPTIVE USE
WATER USE BY COTTON FROM LOW AND MODERATELY SALINE STATIC WATER TABLES,
W71-06221 03C

CONTINUOUS FARMING
PLANTING CORN IN NATIVE SOD,
W71-06060 03F

CONTRACTS
MCGEHEE V WILLIAMS (CONTRACT BETWEEN CITIES FOR PROVISION OF WATER).
W71-05836 06E

TOLCHESTER BEACH IMPROVEMENT CO OF KENT COUNTY V BOYD (ABILITY OF PUBLIC TO ACQUIRE PRESCRIPTIVE ACCESS TO WATER)
W71-05998 06E

WORK STARTS ON 11-MILE INTERCEPTOR TO SOLVE TORONTO'S SEWER PROBLEM.
W71-06337 08A

CONTROL STRUCTURES
HOW TO THINK ABOUT INSTRUMENTATION AND CONTROL,
W71-06409 05G

CONTROL SYSTEMS
PLASTICS IN WATER AND SEWAGE CONTROL,
W71-06286 08G

HOW TO THINK ABOUT INSTRUMENTATION AND CONTROL,
W71-06409 05G

OPTIMIZING WASTE TREATMENT CONTROL SYSTEMS,
W71-06414 05D

CONTROLLED FLOODING
YIELD REDUCTION BY CONTROLLED FLOODING OF CORN,
W71-06152 03F

COOLING TOWER EFFECTS
FIELD INVESTIGATION OF ENVIRONMENTAL EFFECTS OF COOLING TOWERS FOR LARGE STEAM ELECTRIC PLANTS,
W71-05930 05D

COOLING TOWERS
FIELD INVESTIGATION OF ENVIRONMENTAL EFFECTS OF COOLING TOWERS FOR LARGE STEAM ELECTRIC PLANTS,
W71-05930 05D

PROBLEMS IN DISPOSAL OF WAST HEAT FROM STEAM-ELECTRIC PLANTS.
W71-05931 08A

FACTORS IN WASTE HEAT DISPOSAL ASSOCIATED WITH POWER GENERATION,
W71-05932 08A

COOLING WATER
FIELD INVESTIGATION OF ENVIRONMENTAL EFFECTS OF COOLING TOWERS FOR LARGE STEAM ELECTRIC PLANTS,
W71-05930 05D

PROBLEMS IN DISPOSAL OF WAST HEAT FROM STEAM-ELECTRIC PLANTS.
W71-05931 08A

FACTORS IN WASTE HEAT DISPOSAL ASSOCIATED WITH POWER GENERATION,
W71-05932 08A

COOLING WATER RESOURCES AND POWER GENERATION,
W71-06091 05G

COOPERATIVES
RURAL WATER DISTRICTS--HERE IS WHY THEY ARE NEEDED,
W71-06061 06B

COPEPODS
A STUDY OF RELATIONSHIPS BETWEEN ZOOPLANKTON ABUNDANCE AND SELECTED ENVIRONMENTAL VARIABLES IN THE PAMLICO RIVER ESTUARY OF EASTERN NORTH CAROLINA,
W71-05985 02I

COPPER ALLOYS
IMPROVEMENT OF THE CORROSION RESISTANCE OF ALUMINUM BRASS FOR USE IN SEA WATER CONVERSION PLANTS,
W71-06234 08G

COPPER LAKE(IDAHO)
SOME EFFECTS OF ANTIMYCIN IN AN OLIGOTROPHIC LAKE,
W71-06323 05C

CORN(FIELD)
PLANTING CORN IN NATIVE SOD,
W71-06060 03F

A COMPARISON OF WATER USE FOR HYBRID CORN IN THE BEKAA AND THE COASTAL PLAIN,
W71-06067 03F

YIELD REDUCTION BY CONTROLLED FLOODING OF CORN,
W71-06152 03F

CORRELATION ANALYSIS
SNOW COURSE WEIGHTING PROCEDURE,
W71-06146 07C

CORROSION
IMPROVEMENT OF THE CORROSION RESISTANCE OF ALUMINUM BRASS FOR USE IN SEA WATER CONVERSION PLANTS,
W71-06234 08G

APPLICATION OF IRON-ALUMINUM BASE ALLOYS TO SALINE WATER CONVERSION,
W71-06235 08G

CALCAREOUS PIPE FOR SEWERS,
W71-06407 08F

COST ANALYSIS
ECONOMICS OF COMBINING DISTILLED SEAWATER AND RENOVATED WASTE WATER AS A NEW SOURCE OF MUNICIPAL WATER SUPPLY,
W71-06238 03A

TRENCHER AND BOX SHIELD MAKE SEWER JOB ALMOST ONE-RIG OPERATION.
W71-06334 08C

CONSTRUCTION COST REQUIREMENTS FOR WATER AND WASTE WATER FACILITIES.
W71-06347 05D

INCREASING SEWAGE FLOW VELOCITY BY USING CHEMICAL ADDITIVES,
W71-06400 08B

COST BENEFIT ANALYSIS
A MODEL OF PUBLIC DECISIONS ILLUSTRATED BY A WATER POLLUTION POLICY PROBLEM,
W71-05939 06A

ECONOMIC ANALYSIS IN NATURAL RESOURCE PROGRAMS,
W71-05940 06B

THE ORGANIZATION OF ECONOMIC ACTIVITY ISSUES PERTINENT TO THE CHOICE OF MARKET VERSUS NONMARKET ALLOCATION,
W71-05966 06C

COSTS
THE ORGANIZATION OF ECONOMIC ACTIVITY ISSUES PERTINENT TO THE CHOICE OF MARKET VERSUS NONMARKET ALLOCATION,
W71-05966 06C

INSTALLATION OF SOIL, WASTE AND DRAINAGE PIPING IN FILL OR UNSTABLE SOIL,
W71-06285 08A

ECONOMIC DESIGN OF CENTRAL WATER SUPPLY SYSTEMS FOR MEDIUM SIZED TOWNS,
W71-06312 06B

WINNER 3.6 UNDER ON CALIFORNIA STORM DRAIN.
W71-06340 08F

COST-BENEFIT ANALYSIS
QUANTITATIVE ANALYSIS IN PUBLIC FINANCE,
W71-05947 06A

A CRITICAL SURVEY OF USE OF COST-BENEFIT ANALYSIS IN PUBLIC FINANCE,
W71-05948 06C

THE FISCAL ECONOMIST AND QUANTITATIVE ANALYSIS,
W71-05956 06C

MEASURING EFFICIENCY IN GOVERNMENT SERVICES,
W71-05957 06B

COLLECTIVE ACTION AND THE DISTRIBUTION OF INCOME A CONCEPTUAL APPROACH,
W71-05960 06C

INSTITUTIONAL OBSTACLES TO REALLOCATING GOVERNMENT EXPENDITURES,
W71-05961 06B

PROJECT DESIGN AND EVALUATION WITH MULTIPLE OBJECTIVES,
W71-05962 06B

THE ABSENCE OF KNOWLEDGE OF DISTRIBUTIONAL IMPACTS AN OBSTACLE TO EFFECTIVE POLICY ANALYSIS AND DECISIONS,
W71-05963 06B

EXTERNALITIES, INFORMATION AND ALTERNATIVE COLLECTIVE ACTION,
W71-05964 06B

THE TREATMENT OF RISK AND UNCERTAINTY,
W71-05965 06B

RESCUING POLICY ANALYSIS FROM PPBS,
W71-05968 06B

SAFE YIELD OF AQUIFERS AN ECONOMIC REFORMULATION,
W71-06126 06B

TV INSPECTION AND IN-PLACE GROUTING OF SEWERS,
W71-06427 07B

COTTON
PHYSIOLOGY OF BOLL SHEDDING IN COTTON IV. CORRELATION STUDIES ON FLOWER PRODUCTION AND BOLL SHEDDING IN RELATION TO TEMPERATURE AND RAINFALL,
W71-06056 03F

EFFECTS OF IRRIGATION INTENSITY AND NITROGEN LEVEL ON THE PERFORMANCE OF EIGHT VARIETIES OF UPLAND COTTON, GOSSPYIUM HIRSUTUM L.,
W71-06068 03F

THE INFLUENCE OF VARIOUS SOIL MOISTURE-REGIMES ON THE YIELD AND QUALITY OF COTTON IN AN ARID ZONE,
W71-06217 03F

WATER USE BY COTTON FROM LOW AND MODERATELY SALINE STATIC WATER TABLES,
W71-06221 03C

CRABS
SOME ASPECTS OF BIOLOGY OF CARCINUS MAENAS (L) II SURVIVAL AT LOW SALINITY,
W71-06179 05C

CRANES
WASHED-OUT PLATE CULVERT RESET IN 17-TON SECTIONS BY CRANE.
W71-06336 08A

CRICETID RODENTS
THE ROLE OF SUCCULENT HALOPHYTES IN THE WATER BALANCE OF SALT MARSH RODENTS,
W71-06073 02I

CROP PRODUCTION
PHYSIOLOGY OF BOLL SHEDDING IN COTTON IV. CORRELATION STUDIES ON FLOWER PRODUCTION AND BOLL SHEDDING IN RELATION TO TEMPERATURE AND RAINFALL,
W71-06056 03F

ESTABLISHMENT OF PERENNIAL FORAGES I. SUBSEQUENT YIELDS II. SUBSEQUENT ROOT DEVELOPMENT,
W71-06215 03F

THE INFLUENCE OF VARIOUS SOIL MOISTURE-REGIMES ON THE YIELD AND QUALITY OF COTTON IN AN ARID ZONE,
W71-06217 03F

CROP RESPONSE
YIELD REDUCTION BY CONTROLLED FLOODING OF CORN,
W71-06152 03F

CRUSTACEANS
CRUSTACEANS AND FISHES IN THE SEA GRANT PONDS,
W71-06016 02L

CSM-12
EVALUATION OF AN AUTOMATIC CHEMICAL ANALYSIS MONITOR FOR WATER QUALITY PARAMETERS,
W71-06005 05A

CULTURES
ALGAECIDAL EVALUATION AND ENVIRONMENTAL STUDY OF MAT

PRODUCING BLUEGREEN ALGAE,
W71-06102 04A

CULVERTS
EDWARDS V ATCHISON, T AND S F RR (PRESCRIPTIVE RIGHT TO DISCHARGE WATER).
W71-05994 06E

JONES V LOUISVILLE AND NASHVILLE RY (RECOVERY FOR FLOOD DAMAGE BY CONTRIBUTOR THERETO).
W71-06303 06E

WASHED-OUT PLATE CULVERT RESET IN 17-TON SECTIONS BY CRANE.
W71-06336 08A

CORRUGATED STEEL PIPE STORM SEWERS.
W71-06420 08G

CURRENT METERS
A CASE STUDY OF COASTAL CURRENTS IN LAKE MICHIGAN,
W71-06174 02H

CURRENTS(WATER)
SUMMER THERMAL STRUCTURE AND CIRCULATION OF CHEQUAMEGON BAY, LAKE SUPERIOR--A FLUCTUATING SYSTEM,
W71-05885 02H

WIND INDUCED CIRCULATION PATTERN IN A ROTATING MODEL OF LAKE ERIE,
W71-05891 02H

STATISTICAL ANALYSIS OF CURRENTS AT TWO NEAR-BY STATIONS IN LAKE MICHIGAN, SUMMER, 1967,
W71-05893 02H

HYDRAULIC AND WIND-INDUCED CIRCULATION IN A MODEL OF A GREAT LAKE,
W71-05897 02H

HORIZONTAL TRANSPORT IN A ROTATING BASIN OF PARABOLIC DEPTH PROFILE,
W71-05903 02E

WIND-DRIVEN CURRENTS IN A LONG ROTATING CHANNEL,
W71-05904 02E

JULY CURRENTS NEAR THE SOUTH SHORE OF LAKE ONTARIO,
W71-05978 02H

A CASE STUDY OF COASTAL CURRENTS IN LAKE MICHIGAN,
W71-06174 02H

CYCLING NUTRIENTS
PHOSPHORUS FLUX BETWEEN WATER AND PLANKTON A PRELIMINARY REPORT,
W71-06018 02L

CYTOLOGICAL STUDIES
ON THE OCCURRENCE OF TRANS-3-HEXADECANOIC ACID IN CHLORELLA CELLS, (IN RUSSIAN),
W71-05989 02K

STUDIES ON ULVA AND OTHER BENTHONIC MARINE ALGAE RECEIVING TREATED SEWAGE IN PONDS AND IN CALICO CREEK AT MOREHEAD CITY, NORTH CAROLINA,
W71-06021 02L

DAMAGES
O'HEARN V TOWN OF ADAMS (DAMAGES FOR OVERFLOW OF SEWAGE).
W71-05967 06E

KELLY V CITY OF CAPE GIRARDEAU (LIABILITY OF CITY FOR FAILURE TO PROVIDE ADEQUATE STORM SEWERS).
W71-05997 06E

COLONNA V STATE (DAMAGES FOR FLOODING OF QUARRY).
W71-06164 06E

DAMS
UNITED STATES V BIG HORN LAND AND CATTLE CO (FORFEITURE OF RIGHT-OF-WAY ON PUBLIC LAND).
W71-05911 06E

APPALACHIAN ELECTRIC POWER CO V SMITH (CONSTITUTIONALITY OF HYDROELECTRIC PROJECT LICENSING).
W71-05977 06E

DATA COLLECTIONS
RADIOCHEMICAL ANALYSES OF WATER FROM SELECTED STREAMS, WELLS, SPRINGS, AND PRECIPITATION COLLECTED PRIOR TO REENTRY DRILLING, PROJECT RULISON,
W71-05842 05A

GROUNDWATER RESOURCES OF THE LOYSVILLE AND MIFFLINTOWN QUADRANGLES IN SOUTH-CENTRAL PENNSYLVANIA,
W71-05853 04B

SUMMARY OF DATA ON TEMPERATURE OF STREAMS IN NORTH CAROLINA, 1943-67,
W71-05855 07C

VISUAL WAVE OBSERVATIONS ALONG THE LAKE MICHIGAN SHORE,
W71-05899 02H

A PROPOSED STREAMFLOW-DATA PROGRAM FOR NEBRASKA,
W71-06128 07A

WESTERN SNOW CONFERENCE.
W71-06133 02C

THE SURFACE INSTRUMENT NETWORK OF THE UPPER COLORADO RIVER PILOT PROJECT,
W71-06136 07A

USING ALL AVAILABLE HYDROLOGIC DATA,
W71-06138 07C

THE AUTOMATIC HYDROLOGICAL RADIO REPORTING NETWORK, NEW ENGLAND DIVISION, CORPS OF ENGINEERS,
W71-06149 07A

WATER QUALITY OF THE DELAWARE RIVER ESTUARY, JULY THROUGH DECEMBER 1967,
W71-06156 05A

AVAILABILITY OF GROUNDWATER IN DECATUR COUNTY, IOWA,
W71-06175 02F

THE MONOCACY RIVER-PHYSICAL, CHEMICAL AND BACTERIOLOGICAL WATER QUALITY REPORT NUMBER 1, MARCH-DECEMBER 1966,
W71-06176 05B

WATER RELATED LAND USE IN THE BEAR RIVER DRAINAGE AREA,
W71-06212 07C

WATER RELATED LAND USE IN THE UTAH LAKE DRAINAGE AREA,
W71-06213 07C

STATISTICAL SUMMARIES OF NEW JERSEY STREAMFLOW RECORDS,
W71-06228 07C

WELL RECORDS, DEPTH-TO-WATER MEASUREMENTS, CHEMICAL ANALYSES OF GROUND WATER, DRILLERS LOGS, AND ELECTRIC-LOG INFORMATION IN HEMPSTEAD, LAFAYETTE, LITTLE RIVER, MILLER, AND NEVADA COUNTIES, ARKANSAS,
W71-06229 04B

DENSE NETWORK FOR RAPID MEASUREMENT OF RAINFALL RATE,
W71-06410 02B

DATA PROCESSING
USING ALL AVAILABLE HYDROLOGIC DATA,
W71-06138 07C

DATA STORAGE AND RETRIEVAL
PROBLEM OF FLOOD-CONTROL IN SMALL BASINS,
W71-06298 07C

DATA TRANSMISSION
THE AUTOMATIC HYDROLOGICAL RADIO REPORTING NETWORK, NEW ENGLAND DIVISION, CORPS OF ENGINEERS,
W71-06149 07A

DEBRIS AVALANCHES
REPORT ON TRAPEZOIDAL FLUME MODEL.
W71-05929 08B

DECATUR COUNTY(IOWA)
AVAILABILITY OF GROUNDWATER IN DECATUR COUNTY, IOWA,
W71-06175 02F

DECHERD
COMMUNITY FACILITIES PLAN WATER AND SEWER PLAN PUBLIC IMPROVEMENTS PROGRAM AND CAPITAL BUDGET, DECHERD, TENNESSEE.
W71-06105 06B

DECISION MAKING
INFORMATION FOR DECISION MAKING,
W71-05953 06B

SENSITIVITY ANALYSIS IN DECISION MAKING,
W71-05955 06B

THE ROLE OF INCENTIVES, PENALTIES, AND REWARDS IN ATTAINING EFFECTIVE POLICY,
W71-05959 06B

WATER RESOURCES MANAGEMENT IN THE PUBLIC INTEREST,
W71-06314 06B

PUBLIC PARTICIPATION IN WATER PLANNING A CRITIQUE OF THEORY, DOCTRINE, AND PRACTICE,
W71-06315 06B

DECISIONMAKING
A MODEL OF PUBLIC DECISIONS ILLUSTRATED BY A WATER POLLUTION POLICY PROBLEM,
W71-05939 06A

DECISION-MAKING
PROJECT DESIGN AND EVALUATION WITH MULTIPLE OBJECTIVES,
W71-05962 06B

RESCUING POLICY ANALYSIS FROM PPBS,
W71-05968 06B

DEFORESTATION
REPORT ON BIOLOGICAL, CHEMICAL, AND GEOLOGICAL STUDIES OF BOIS BRULE AND POPLAR RIVER WATERSHEDS,
W71-05986 05C

DEFORMATION
THE INFLUENCE OF STRAINS IN SOIL MECHANICS,
W71-05907 08D

DELAWARE
STATE OF NEW JERSEY V STATE OF DELAWARE (LOCATION OF DELAWARE RIVER BOUNDARY BETWEEN NEW JERSEY AND DELAWARE).
W71-06172 06E

DELAWARE RIVER
WATER QUALITY OF THE DELAWARE RIVER ESTUARY, JULY THROUGH

DECEMBER 1967,
W71-06156 05A

DELTAS
SEDIMENTS OF THE MODERN NIGER DELTA A SUMMARY AND REVIEW,
W71-05856 02J

DEPOSITIONAL SEQUENCES AND SAND DISTRIBUTION IN THE POSTGLACIAL RHONE DELTA COMPLEX,
W71-05857 02J

SEDIMENTATION IN A MALAYSIAN HIGH TIDE TROPICAL DELTA,
W71-05858 02J

HYDROGRAPHY, SEDIMENT DISPERSAL, AND RECENT HISTORICAL DEVELOPMENT OF THE PO RIVER DELTA, ITALY,
W71-05859 02J

FACIES AND DEVELOPMENT OF THE COLORADO RIVER DELTA IN TEXAS,
W71-05860 02J

DEMAND FOR LEISURE
THE DEMAND FOR LEISURE,
W71-05970 06D

DEMAND-ORIENTED WATER POLICY
IMPROVING WATER RESOURCE ALLOCATION THROUGH DEMAND-ORIENTED WATER PCLICY,
W71-06316 06B

DEMINERALIZATION
CONDITIONS AFFECTING THE REDUCTION OF IRON AND MANGANESE BY BACTERIA IN THE ORE-BEARING LAKES OF THE KARELIAN ISTHMUS,
W71-05993 02K

DEMONSTRATION WATERSHEDS
REPORT CN TRAPEZOIDAL FLUME MODEL.
W71-05929 08B

DENDROCHRONOLOGY
MULTIVARIATE TECHNIQUES FOR SPECIFYING TREE-GROWTH AND CLIMATE RELATIONSHIPS AND FOR RECONSTRUCTING ANOMALIES IN PALEOCLIMATE,
W71-05851 02B

DENDROCLIMATOLOGY
MULTIVARIATE TECHNIQUES FOR SPECIFYING TREE-GROWTH AND CLIMATE RELATIONSHIPS AND FOR RECONSTRUCTING ANOMALIES IN PALEOCLIMATE,
W71-05851 02B

DENSITY
DENSITIES OF PRAIRIE SNOWPACKS,
W71-06137 02C

VARIATION OF GROUND SNOW LOADS IN BRITISH COLUMBIA,
W71-06140 02C

DEVELOPMENT OF SNOW LOAD DESIGN DATA FOR THE UNITED STATES,
W71-06141 02C

AN APPROACH TO SNOW LOAD EVALUATION,
W71-06142 02C

SNOW LOADS FOR THE DESIGN OF ROOFS IN CANADA,
W71-06143 08A

DENTRIFICATION
METHANOL REQUIREMENT AND TEMPERATURE EFFECTS IN WASTE WATER DENITRIFICATION,
W71-06246 05D

DEPOSITION(SEDIMENT)
SEDIMENTS OF THE NORTHERN MIDDLE AMERICA TRENCH,
W71-05844 02J

DESALINATION
IMPROVEMENT OF THE CORROSION RESISTANCE OF ALUMINUM BRASS FOR USE IN SEA WATER CONVERSION PLANTS,
W71-06234 08G

APPLICATION OF IRON-ALUMINUM BASE ALLOYS TO SALINE WATER CONVERSION,
W71-06235 08G

RESEARCH ON PIEZODIALYSIS - SECOND REPORT,
W71-06236 03A

BOUNDARY LAYER FLOW PROBLEMS IN DESALINATION BY REVERSE OSMOSIS,
W71-06237 03A

ECONOMICS OF COMBINING DISTILLED SEAWATER AND RENOVATED WASTE WATER AS A NEW SOURCE OF MUNICIPAL WATER SUPPLY,
W71-06238 03A

FIRST ANNUAL REPORT - OPERATION OF THE MULTI-EFFECT MULTI-STAGE FLASH DISTILLATION PLANT (CLAIR ENGLE), SAN DIEGO, CALIFORNIA.
W71-06241 03A

SECOND ANNUAL REPORT - OPERATION OF THE MULTI-EFFECT MULTI-STAGE FLASH DISTILLATION PLANT (CLAIR ENGLE), SAN DIEGO, CALIFORNIA.
W71-06242 03A

DESALINATION EQUIPMENT
FIRST ANNUAL REPORT - OPERATION OF THE MULTI-EFFECT MULTI-STAGE FLASH DISTILLATION PLANT (CLAIR ENGLE), SAN DIEGO, CALIFORNIA.
W71-06241 03A

SECOND ANNUAL REPORT - OPERATION OF THE MULTI-EFFECT MULTI-STAGE FLASH DISTILLATION PLANT (CLAIR ENGLE), SAN DIEGO, CALIFORNIA.
W71-06242 03A

DESALINATION PLANTS
FIRST ANNUAL REPORT - OPERATION OF THE MULTI-EFFECT MULTI-STAGE FLASH DISTILLATION PLANT (CLAIR ENGLE), SAN DIEGO, CALIFORNIA.
W71-06241 03A

SECOND ANNUAL REPORT - OPERATION OF THE MULTI-EFFECT MULTI-STAGE FLASH DISTILLATION PLANT (CLAIR ENGLE), SAN DIEGO, CALIFORNIA.
W71-06242 03A

OAK RIDGE NATIONAL LABORATORY VERTICAL TUBE EVAPORATOR PILOT PLANT ANNUAL REPORT FOR FISCAL YEAR 1969.
W71-06243 03A

OAK RIDGE NATIONAL LABORATORY VERTICAL TUBE EVAPORATOR PILOT PLANT - ANNUAL REPORT FOR FISCAL YEAR 1970.
W71-06244 03A

DESALINATION PROCESSES
SURVEY OF DESALTING PROCESSES FOR USE IN WASTE WATER TREATMENT,
W71-06042 05D

BOUNDARY LAYER FLOW PROBLEMS IN DESALINATION BY REVERSE OSMOSIS,
W71-06237 03A

OAK RIDGE NATIONAL LABORATORY VERTICAL TUBE EVAPORATOR PILOT PLANT ANNUAL REPORT FOR FISCAL YEAR 1969.
W71-06243 03A

SURVEY OF DESALTING PROCESSES FOR USE IN WASTE WATER TREATMENT,
W71-06268 05D

DESCHUTES RIVER(OREG)
THE DESCHUTES RIVER HYDROGRAPH FORECAST,
W71-06144 04A

DESIGN
A STUDY OF THE DESIGN PARAMETERS OF UHV LINES,
W71-05914 08C

WATER QUALITY TELEMETRY FINAL PROGRESS REPORT,
W71-06069 05G

STABILIZED BASE FOR RESIDENTIAL STREETS,
W71-06292 08F

WORK STARTS ON 11-MILE INTERCEPTOR TO SOLVE TORONTO'S SEWER PROBLEM.
W71-06337 08A

STORMWATER SEWER DESIGN IN METRIC.
W71-06342 08A

ISLAND CITY SOLVES TOUGH SEWERAGE PROBLEM.
W71-06346 08A

A NEW TWIST (90 DEGREES IN FACT) TO SEGMENTED SEWER - PIPE DESIGN.
W71-06376 08A

A RE-EXAMINATION OF THE STORM TANK PROBLEM,
W71-06377 05D

BUILDING DRAINAGE PUMP STATIONS WITHIN LIMITED BUDGET,
W71-06378 08C

SOLVING A SEWER OVERFLOW PROBLEM,
W71-06387 08C

DENSE NETWORK FOR RAPID MEASUREMENT OF RAINFALL RATE,
W71-06410 02B

NEW IDEAS FOR CALCULATING STORM WATER OVERFLOW SETTINGS AND THE DESIGN OF STORM WATER TANKS.
W71-06416 08A

CORRUGATED STEEL PIPE STORM SEWERS.
W71-06420 08G

TANKS.
W71-06421 08G

STRUCTURES PREVENT URBAN SEDIMENT DAMAGE,
W71-06425 04D

DESIGN CRITERIA
INTERNATIONAL BUILDING EXHIBITION - OLYMPIA LONDON 13-25 NOVEMBER 1969.
W71-06348 08A

STORM OVERFLOWS AND STORM SEWAGE,
W71-06367 05G

DEPTH OF FLOW AS DESIGN CRITERION FOR CHANNELS WITH ARTIFICIAL LINERS,
W71-06399 08B

PLASTICS IN WATER AND SEWAGE CONTROL,
W71-06424 08G

DESIGN STANDARDS

DESIGN CRITERIA FOR MUNICIPAL WASTE WATER TREATMENT PLANTS IN TENNESSEE,
W71-06043 05D

STORM OVERFLOWS AND STORM SEWAGE,
W71-06367 05G

DESIGN STORM
EXTRAPOLATION OF HISTORICAL STORM DATA FOR ESTIMATING DESIGN WAVE HEIGHTS,
W71-06123 07C

RATIONAL 'RATIONAL' METHOD OF STORM DRAINAGE DESIGN.
W71-06393 08B

DETACHMENT
POLLUTION BY SEDIMENT SOURCES AND THE DETACHMENT AND TRANSPORT PROCESSES,
W71-06430 05B

DETERGENTS
DETERMINATION OF THE BIODEGRADABILITY OF ANIONIC SYNTHETIC SURFACE ACTIVE AGENTS.
W71-05990 05D

DEVELOPMENT OF PHOSPHATE-FREE HOME LAUNDRY DETERGENTS,
W71-06247 05G

EFFECTS OF ALKYL BENZENE SULFONATE ON RAINBOW TROUT,
W71-06325 05C

DETERIORATION
DEGRADATION OF WATER QUALITY IN IRRIGATION RETURN FLOWS,
W71-06063 03F

DEWATERING
MOISTURE TRANSPORT IN SLUDGE DEWATERING AND DRYING ON SAND BEDS,
W71-06031 05D

PHYSICAL PROPERTIES AND PROCESSING CHARACTERISTICS OF MACROPHYTES AS RELATED TO MECHANICAL HARVESTING,
W71-06188 04A

DIALYSIS
RESEARCH ON PIEZODIALYSIS - SECOND REPORT,
W71-06236 03A

DIATOMS
PLANKTON DIATOM ASSEMBLAGES IN LAKE MICHIGAN,
W71-05984 05C

ANTIBACTERIAL ACTIVITY OF A MARINE DIATOM ASTERIONELLA NOTATA (GRUN) (IN FRENCH),
W71-06211 05C

DIETS
NITROGEN AND AMINO ACIDS IN THE FECES OF YOUNG PIGS RECEIVING A PROTEIN-FREE DIET AND DIETS CONTAINING GRADED LEVELS OF SOYBEAN OIL MEAL OR CASEIN,
W71-06451 05B

DIFFUSION
DIFFUSION FROM A CONTINUOUS SOURCE IN A UNIFORM SHEAR FLOW,
W71-05872 05B

LARGE-SCALE DIFFUSION STUDIES AT NIAGARA RIVER MOUTH, LAKE ONTARIO,
W71-05901 07B

DIMENSIONAL ANALYSIS
SEEPAGE FACE EFFECTS IN UNSTEADY GROUNDWATER FLOW,
W71-06190 02F

DIQUAT
THE EFFECTS OF THE HERBICIDES DIQUAT AND DICHLOBENIL (CASORON) ON POND INVERTEBRATES PART I. ACUTE TOXICITY,
W71-06181 05C

DISCHARGE COEFFICIENTS
DETERMINATION OF FLOOD FLOWS AND DISCHARGE COEFFICIENTS IN MUNICIPAL SEWERAGE SYSTEMS,
W71-06395 08B

DISCHARGE MEASUREMENT
THE LE ACOUSTIC FLOWMETER - AN APPLICATION TO DISCHARGE MEASUREMENT,
W71-06293 08B

DISCHARGE(WATER)
EDWARDS V ATCHISON, T AND S F RR (PRESCRIPTIVE RIGHT TO DISCHARGE WATER).
W71-05994 06E

DISINFECTION
WASTE REDUCTION IN FOOD CANNING OPERATIONS,
W71-06257 05D

DISPERSANTS
STUDY OF EQUIPMENT AND METHODS FOR REMOVING OR DISPERSING OIL FROM OPEN WATERS,
W71-06106 05G

DISPERSION
DIFFUSION FROM A CONTINUOUS SOURCE IN A UNIFORM SHEAR FLOW,
W71-05872 05B

LARGE-SCALE DIFFUSION STUDIES AT NIAGARA RIVER MOUTH, LAKE ONTARIO,
W71-05901 07B

ONE-DIMENSIONAL OPEN CHANNEL HEAT DISPERSION,
W71-06085 05G

TURBULENT DISPERSION IN POROUS MATERIALS AS MODELED BY A MIXING CELL WITH STAGNANT ZONE,
W71-06122 02F

DISPOSAL
AGRICULTURE WASTE RESEARCH NEEDS,
W71-06452 05D

DISSOLVED GASES
DEVELOPMENT OF AN INSTRUMENT FOR MEASURING THE CONCENTRATION OF DISSOLVED OXYGEN IN SEA WATER IN SITU,
W71-06104 05A

DISSOLVED OXYGEN
DIURNAL CHANGES IN STRATIFICATION AND DISSOLVED OXYGEN IN THE SURFACE WATERS OF LAKE MICHIGAN,
W71-05900 02H

GRAPHIC DISSOLVED OXYGEN COMPUTATION,
W71-06121 01A

DISSOLVED OXYGEN CRITERIA FOR THE PROTECTION OF FISH,
W71-06182 05C

DISSOLVED OXYGEN ANALYZERS
GRAPHIC DISSOLVED OXYGEN COMPUTATION,
W71-06121 01A

DISSOLVED OXYGEN NOMOGRAPH
GRAPHIC DISSOLVED OXYGEN COMPUTATION,
W71-06121 01A

DISSOLVED SOLIDS
MARINE WASTE DISPOSAL AND SEA URCHIN ECOLOGY,
W71-06262 05C

DISTRIBUTION
THE OCCURRENCE OF POLICYCLIC AROMATIC CARBOHYDRATES IN COASTAL WATERS AND ITS POSSIBLE EFFECTS ON MAN'S HEALTH (IN GERMAN),
W71-06207 05C

DISTRIBUTIONAL IMPACTS
THE ABSENCE OF KNOWLEDGE OF DISTRIBUTIONAL IMPACTS AN OBSTACLE TO EFFECTIVE POLICY ANALYSIS AND DECISIONS,
W71-05963 06B

DISTRICTS
INSTITUTIONAL FACTORS INFLUENCING WATER DEVELOPMENT IN TEXAS,
W71-05972 06B

DITCHES
SEEPAGE FACE EFFECTS IN UNSTEADY GROUNDWATER FLOW,
W71-06190 02F

DIURNAL DISTRIBUTION
DIURNAL CHANGES IN STRATIFICATION AND DISSOLVED OXYGEN IN THE SURFACE WATERS OF LAKE MICHIGAN,
W71-05900 02H

DIVERSION
DRAINAGE DIST NO 7 V HAVERSTICK (LIABILITY FOR DIVERSION OF NATURAL WATERCOURSE).
W71-05876 06E

OLIVER V CITY OF RICHMOND (COMPENSATION FOR STATE DIVERSION OF A NAVIGABLE STREAM).
W71-06162 06E

DOCKS
QUINLAN V BOROUGH OF FAIR HAVEN (TITLE DISPUTE TO RIPARIAN LAND AND SUBMERGED LAND UNDER DOCK).
W71-06145 06E

DOCUMENTATION
DIRECTORY OF PERSONNEL, WATER RESOURCES, WESTERN NEW YORK.
W71-06150 09A

DRAIN PIPES
A GUIDE FOR CONTRACTORS ON THE CONSTRUCTION OF DRAINAGE SYSTEMS,
W71-06288 08A

DRAINAGE
SELECTED URBAN STORM WATER RUNOFF ABSTRACTS (FIRST QUARTERLY ISSUE).
W71-06254 04C

DRAINAGE CHANNELS
LOW COST STORM DRAINAGE WITH PAVED CHANNELS,
W71-06413 08F

DRAINAGE DISTRICTS
DRAINAGE DIST NO 7 V HAVERSTICK (LIABILITY FOR DIVERSION OF NATURAL WATERCOURSE).
W71-05876 06E

THE CONSERVANCY DISTRICT LAW (OUTLINE AND TEXT OF OHIO CONSERVANCY DISTRICT LAW).
W71-06046 06E

DRAINAGE ENGINEERING
INSTALLATION OF SOIL, WASTE AND DRAINAGE PIPING IN FILL OR UNSTABLE SOIL,
W71-06285 08A

A GUIDE FOR CONTRACTORS ON THE CONSTRUCTION OF DRAINAGE

SYSTEMS,
W71-06288 08A

LONG-TIME DRAINAGE PROBLEM IS ELIMINATED,
W71-06405 08B

DRAINAGE PATTERNS(GEOLOGIC)
A GUIDE FOR CONTRACTORS ON THE CONSTRUCTION OF DRAINAGE SYSTEMS,
W71-06288 08A

DRAINAGE SYSTEMS
PUBLIC WORKS EXHIBITION PREVIEW.
W71-06350 08G

MORE THAN JUST A BUILDING,
W71-06369 08A

METHOD OF AND MEANS FOR DEALING WITH STORM-WATER OVERFLOWS IN SEWERS AND LIKE DRAINAGE SYSTEMS,
W71-06375 08B

ALL YOU SEE IS THE STREAM,
W71-06380 04D

MODIFIED TRENCHER SLICES THROUGH FLINT-HARD ROCK,
W71-06411 08E

LOW COST STORM DRAINAGE WITH PAVED CHANNELS,
W71-06413 08F

DRAINAGE WATER
DEGRADATION OF WATER QUALITY IN IRRIGATION RETURN FLOWS,
W71-06063 03F

DEPTH OF FLOW AS DESIGN CRITERION FOR CHANNELS WITH ARTIFICIAL LINERS,
W71-06399 08B

DRAWDOWN
COMPUTER METHODS FOR TRANSIENT ANALYSIS OF WATER-TABLE AQUIFERS,
W71-05920 02F

DRIFTING
REMARKS ON THE DRIFT OF OILY WASTE IN THE BAY OF HELGOLAND (IN GERMAN),
W71-06206 05B

DRILLING EQUIPMENT
MODIFIED TRENCHER SLICES THROUGH FLINT-HARD ROCK,
W71-06411 08E

DROUGHT SYMPTOMS
THE INFLUENCE OF VARIOUS SOIL MOISTURE-REGIMES ON THE YIELD AND QUALITY OF COTTON IN AN ARID ZONE,
W71-06217 03F

DRY MATTER PRODUCTION
EFFECT OF IRRIGATION ON RECOVERY OF APPLIED NITROGEN BY COTTON,
W71-06216 03F

DRY WELLS
MORE THAN JUST A BUILDING,
W71-06369 08A

DRYING
AGRICULTURE WASTE RESEARCH NEEDS,
W71-06452 05D

DUCKS(WILD)
EFFECTS OF OIL POLLUTION ON WATERFOWL A STUDY OF SALVAGE METHODS,
W71-05983 05C

DUNES
DEFORMATION OF LEE-SIDE LAMINAE IN EOLIAN DUNES,
W71-05845 02J

A STUDY OF FRESHWATER SAND GRAIN SURFACES BY SCANNING ELECT RON MICROSCOPY,
W71-05887 07B

DYLOX
A POTENTIAL CONTROL FOR LEECHES,
W71-06322 05C

DYNAMIC PROGRAMMING
WATER RESOURCES SYSTEMS ANALYSIS OF DISCRETE DIFFERENTIAL DYNAMIC PROGRAMMING,
W71-05922 06A

A PROGRAMMING MODEL FOR FARM IRRIGATION SYSTEMS,
W71-05923 03F

EARTH FILLS
SPECIAL STUDIES OF A SANITARY LANDFILL,
W71-06103 05B

EARTH PRESSURE
EXPERIMENTAL AND THEORETICAL INVESTIGATIONS OF A PASSIVE EARTH PRESSURE PROBLEM,
W71-05919 08D

EASEMENTS
UNITED STATES V BIG HORN LAND AND CATTLE CO (FORFEITURE OF RIGHT-OF-WAY ON PUBLIC LAND).
W71-05911 06E

ASD SECURITIES V J H BELLOWS CO (RIGHT-OF-WAY OF NECESSITY WHEN ACCESS BY WATER BECOMES IMPOSSIBLE).
W71-05958 06E

ALLEN V POTTER (RIGHT TO ERECT BOAT HOIST BELOW LOW WATER MARK).
W71-06280 06E

JACOBS V UNITED STATES (COMPENSATION FOR LAND RENDERED MORE SUSCEPTIBLE TO OVERFLOW).
W71-06296 06E

ECOLOGY
THE ECOLOGY AND OCEANOGRAPHY OF SEWER OUTFALLS,
W71-05928 06G

ALGAECIDAL EVALUATION AND ENVIRONMENTAL STUDY OF MAT PRODUCING BLUEGREEN ALGAE,
W71-06102 04A

ECOLOGY AND SPATIAL ANALYSIS,
W71-06317 06F

ECONOMETRIC ANALYSIS
QUANTITATIVE ANALYSIS IN PUBLIC FINANCE,
W71-05947 06A

ECONOMETRIC TECHNIQUES
THE FISCAL ECONOMIST AND QUANTITATIVE ANALYSIS,
W71-05956 06C

ECONOMIC ANALYSIS
ECONOMIC ANALYSIS IN NATURAL RESOURCE PROGRAMS,
W71-05940 06B

ECONOMIC DESIGN
ECONOMIC DESIGN OF CENTRAL WATER SUPPLY SYSTEMS FOR MEDIUM SIZED TOWNS,
W71-06312 06B

ECONOMIC EFFICIENCY
QUANTITATIVE ANALYSIS IN PUBLIC FINANCE,
W71-05947 06A

A CRITICAL SURVEY OF USE OF COST-BENEFIT ANALYSIS IN PUBLIC FINANCE,
W71-05948 06C

THE FISCAL ECONOMIST AND QUANTITATIVE ANALYSIS,
W71-05956 06C

MEASURING EFFICIENCY IN GOVERNMENT SERVICES,
W71-05957 06B

COLLECTIVE ACTION AND THE DISTRIBUTION OF INCOME A CONCEPTUAL APPROACH,
W71-05960 06C

PROJECT DESIGN AND EVALUATION WITH MULTIPLE OBJECTIVES,
W71-05962 06B

ECONOMIC IMPACT
AN ECONOMIC ANALYSIS OF THE INTERTEMPORAL ALLOCATION OF GROUNDWATER IN THE CENTRAL OGALLALA FORMATION,
W71-06266 04B

ECONOMIC STABILIZATION
COLLECTIVE ACTION AND THE DISTRIBUTION OF INCOME A CONCEPTUAL APPROACH,
W71-05960 06C

ECONOMICS
ECONOMIC ASPECTS,
W71-06447 05G

EFFLUENT CHARGE
WATER POLLUTION CONTROL, RIVER BASIN AUTHORITIES AND ECONOMIC INCENTIVES SOME CURRENT POLICY ISSUES,
W71-05937 06B

EFFLUENT CHARGES
VIEWS OF THE GOVERNORS ON TAX INCENTIVES AND EFFLUENT CHARGES (WATER POLLUTION CONTROL AND ABATEMENT).
W71-06052 05G

ELBA(ALA)
FLOOD PLAIN INFORMATION, ELBA, ALABAMA, PEA RIVER, WHITE WATER AND BEAVER DAM CREEKS.
W71-05867 04A

ELECTROCHEMICAL SENSORS
ION-SELECTIVE ELECTROCHEMICAL SENSORS,
W71-06239 03A

ION-SELECTIVE ELECTROCHEMICAL SENSORS - SECOND REPORT,
W71-06240 03A

ELECTROCHEMISTRY
ION-SELECTIVE ELECTROCHEMICAL SENSORS,
W71-06239 03A

ELECTRODE CHAMBER
AN ELECTRODE CHAMBER FOR RECORDING RESPIRATORY AND OTHER MOVEMENTS OF FREE-SWIMMING ANIMALS,
W71-06328 05A

ELECTRODES
ION-SELECTIVE ELECTROCHEMICAL SENSORS,
W71-06239 03A

ION-SELECTIVE ELECTROCHEMICAL SENSORS - SECOND REPORT,
W71-06240 03A

ELECTRODIALYSIS
STUDY OF MASS TRANSFER IN MEMBRANE PROCESSES,
W71-06233 03A

ELECTROLYTES
THE USE OF CONCENTRATIONS OF ELECTROLYTES AND NATURALLY FLUORESCENT MATERIALS TO STUDY WATER MASS MOVEMENTS IN A FRESHWATER 'ESTUARY',
W71-05877 02L

ELECTRON MICROSCOPES(SCANNING)
A STUDY OF FRESHWATER SAND GRAIN SURFACES BY SCANNING ELECT RON MICROSCOPY,
W71-05887 07B

ELECTRON MICROSCOPY
A STUDY OF FRESHWATER SAND GRAIN SURFACES BY SCANNING ELECT RON MICROSCOPY,
W71-05887 07B

ELECTRONIC EQUIPMENT
AN ELECTRODE CHAMBER FOR RECORDING RESPIRATORY AND OTHER MOVEMENTS OF FREE-SWIMMING ANIMALS,
W71-06328 05A

ELLIPTICAL PIPES
FLOOD CONTROL DESIGN UTILIZES LARGE ELLIPTICAL PIPE,
W71-06302 08A

ELUVIUM
INFRARED PHOTOS CAN MAP SOILS,
W71-06058 07B

EMINENT DOMAIN
OLIVER V CITY OF RICHMOND (COMPENSATION FOR STATE DIVERSION OF A NAVIGABLE STREAM).
W71-06162 06E

COLGATE V PHILADELPHIA ELECTRIC POWER CO (CONSTITUTIONALITY OF CONDEMNATION OF PENNSYLVANIA LAND FOR OVERFLOW FROM MARYLAND DAM).
W71-06173 06E

EMULSIFICATION
STUDY OF EQUIPMENT AND METHODS FOR REMOVING OR DISPERSING OIL FROM OPEN WATERS,
W71-06106 05G

ENERGY
WAVE FORCES IN LAKE ERIE,
W71-05894 02H

ENERGY DISSIPATION
EFFICIENCY OF HYDRAULIC JUMP,
W71-05850 08B

ENERGY RESIDUALS
ENVIRONMENTAL QUALITY MANAGEMENT,
W71-05941 06B

ENGINEERING
WATER QUALITY TELEMETRY FINAL PROGRESS REPORT,
W71-06069 05G

ENGINEERING EDUCATION
OPTIMIZATION TECHNIQUES FOR WATER RESOURCE SYSTEMS,
W71-06062 06A

ENVIRONMENT
INTRODUCTION ISSUES IN FOOD PRODUCTION AND CLEAN WATER,
W71-06429 05G

ENVIRONMENTAL CONTAMINATION
THE PESTICIDE BURDEN IN WATER AND ITS SIGNIFICANCE,
W71-06439 05B

ENVIRONMENTAL ECONOMICS
PESTICIDE RESIDUES AND ENVIRONMENTAL ECONOMICS,
W71-05951 05G

ENVIRONMENTAL EFFECTS
FIELD INVESTIGATION OF ENVIRONMENTAL EFFECTS OF COOLING TOWERS FOR LARGE STEAM ELECTRIC PLANTS,
W71-05930 05D

FACTORS IN WASTE HEAT DISPOSAL ASSOCIATED WITH POWER GENERATION,
W71-05932 08A

ENVIRONMENTALLY-INDUCED CHANGES IN THE FATTY ACIDS OF CHLORELLA,
W71-05992 02I

JAMAICA BAY AND KENNEDY AIRPORT A MULTIDISCIPLINARY ENVIRONMENTAL STUDY.
W71-06045 06G

ENVIRONMENTAL EFFECTS ON WOOD PRODUCTION AND CAMBIAL ACTIVITY IN ZIZIPHUS SPINACHRISTI (L.) WILLD.,
W71-06214 02I

IMPLICATIONS OF WATER QUALITY LAWS FOR THE FEEDLOT INDUSTRY,
W71-06222 05G

ECOLOGY AND SPATIAL ANALYSIS,
W71-06317 06F

ENVIRONMENTAL HEALTH CENTER(U OF MO)
GEOCHEMICAL SURVEY OF MISSOURI, PLANS AND PROGRESS FOR SECOND SIX-MONTH PERIOD (JANUARY-JUNE, 1970).
W71-05854 02K

ENVIRONMENTAL HEALTH CENTER(UNIV OF MO)
GEOCHEMICAL SURVEY OF MISSOURI, PLANS AND PROGRESS FOR FIRS SIX-MONTH PERIOD (JULY-DECEMBER, 1969).
W71-05874 02K

ENVIRONMENTAL MANAGEMENT
STRATEGIES FOR ENVIRONMENTAL MANAGEMENT,
W71-05935 06B

ENVIRONMENTAL QUALITY
ENVIRONMENTAL QUALITY MANAGEMENT,
W71-05941 06B

EOLIAN DUNES
DEFORMATION OF LEE-SIDE LAMINAE IN EOLIAN DUNES,
W71-05845 02J

EQUIPMENT
PLASTICS IN WATER AND SEWAGE CONTROL,
W71-06286 08G

TV INSPECTION AND IN-PLACE GROUTING OF SEWERS,
W71-06427 07B

EROSION
DASHNER V WOODS BROS CONST CO (IMPLEMENTATION OF RIVER PROTECTION PROJECT).
W71-06087 06E

EROSION CONTROL
PLANTING CORN IN NATIVE SOD,
W71-06060 03F

PINYON-JUNIPER CONTROL WHERE. WHY,
W71-06225 04D

DEPTH OF FLOW AS DESIGN CRITERION FOR CHANNELS WITH ARTIFICIAL LINERS,
W71-06399 08B

EROSION EQUATION
POLLUTION BY SEDIMENT SOURCES AND THE DETACHMENT AND TRANSPORT PROCESSES,
W71-06430 05B

ESTIMATED COSTS
A NEW TWIST (90 DEGREES IN FACT) TO SEGMENTED SEWER - PIPE DESIGN.
W71-06376 08A

ESTIMATING EQUATIONS
RADIAL WATER AND SOLUTE FLOWS IN ROOTS OF ZEA MAYS I. WATER FLOW,
W71-06064 02I

ESTUARIES
EH AS AN OPERATIONAL PARAMETER IN ESTUARINE STUDIES,
W71-05873 02L

THE USE OF CONCENTRATIONS OF ELECTROLYTES AND NATURALLY FLUORESCENT MATERIALS TO STUDY WATER MASS MOVEMENTS IN A FRESHWATER 'ESTUARY',
W71-05877 02L

A STUDY OF RELATIONSHIPS BETWEEN ZOOPLANKTON ABUNDANCE AND SELECTED ENVIRONMENTAL VARIABLES IN THE PAMLICO RIVER ESTUARY OF EASTERN NORTH CAROLINA,
W71-05985 02I

EUTROPHICATION STUDIES OF A SHALLOW INLET ON VANCOUVER ISLAND,
W71-05988 02L

STUDIES OF MARINE ESTUARINE ECOSYSTEMS DEVELOPING WITH TREATED SEWAGE WASTES,
W71-06012 02L

FUNGAL SURVEY IN WASTE PONDS AND CREEK,
W71-06013 02L

THE USE OF CARBON-14 FOR THE STUDY OF THE UPTAKE AND UTILIZATION OF PHYTOPLANKTON BY RANGEA CUNEATA,
W71-06019 02L

BENTHIC PRODUCTIVITY,
W71-06020 02L

STUDIES ON ULVA AND OTHER BENTHONIC MARINE ALGAE RECEIVING TREATED SEWAGE IN PONDS AND IN CALICO CREEK AT MOREHEAD CITY, NORTH CAROLINA,
W71-06021 02L

THERMAL DISCHARGE A MODEL - PROTOTYPE COMPARISON,
W71-06095 05B

WATER QUALITY OF THE DELAWARE RIVER ESTUARY, JULY THROUGH DECEMBER 1967,
W71-06156 05A

EUTROPHICATION
REPORT ON BIOLOGICAL, CHEMICAL, AND GEOLOGICAL STUDIES OF BOIS BRULE AND POPLAR RIVER WATERSHEDS,
W71-05986 05C

EUTROPHICATION STUDIES OF A SHALLOW INLET ON VANCOUVER ISLAND,
W71-05988 02L

MONTHLY VARIATION IN PHOSPHATE AND RELATED CHEMICALS FOUND

IN THE SEDIMENT IN THE ISLAND AREA OF LAKE ERIE, 1967-68, WITH REFERENCE TO SAMPLES COLLECTED IN 1964, 1965, AND 1966,
W71-06187 05B

DEVELOPMENT OF PHOSPHATE-FREE HOME LAUNDRY DETERGENTS,
W71-06247 05G

EFFECTS OF AGRICULTURAL POLLUTION ON EUTROPHICATION,
W71-06443 05C

EVALUATION
ECONOMICS OF COMBINING DISTILLED SEAWATER AND RENOVATED WASTE WATER AS A NEW SOURCE OF MUNICIPAL WATER SUPPLY,
W71-06238 03A

A POTENTIAL CONTROL FOR LEECHES,
W71-06322 05C

EVAPORATION
ESTIMATES OF MONTHLY EVAPORATION LOSSES FROM THE GREAT LAKES 1950 TO 1968 BASED ON THE MASS TRANSFER TECHNIQUE,
W71-05892 02D

EVAPORATORS
OAK RIDGE NATIONAL LABORATORY VERTICAL TUBE EVAPORATOR PILOT PLANT ANNUAL REPORT FOR FISCAL YEAR 1969.
W71-06243 03A

OAK RIDGE NATIONAL LABORATORY VERTICAL TUBE EVAPORATOR PILOT PLANT - ANNUAL REPORT FOR FISCAL YEAR 1970.
W71-06244 03A

EVAPOTRANSPIRATION
A COMPARISON OF WATER USE FOR HYBRID CORN IN THE BEKAA AND THE COASTAL PLAIN,
W71-06067 03F

EFFECT OF TIME OF EXPOSURE TO SALINITY ON GROWTH, WATER STATUS AND SALT ACCUMULATION IN BEAN PLANTS,
W71-06074 02I

EVAPOTRANSPIRATION CONTROL
WATER CONSERVATION BY REMOVAL OF PHREATOPHYTES,
W71-06154 03B

EVERGLADES
WATER QUALITY AT THE DADE-COLLIER TRAINING AND TRANSITION AIRPORT, MIAMI INTERNATIONAL AIRPORT, AND COTTONMOUTH CAMP-EVERGLADES NATIONAL PARK, FLORIDA, NOVEMBER, 1969,
W71-06158 05A

EVERGLADES NATIONAL PARK(FLORIDA)
SALINE ARTESIAN WATER AS A SUPPLEMENT,
W71-06124 03C

EXCAVATION
SCAPER PRODUCTION SPEEDS PIPE TRENCHING AT LOWER COSTS,
W71-06287 08C

TRENCHER AND BOX SHIELD MAKE SEWER JOB ALMOST ONE-RIG OPERATION.
W71-06334 08C

EXCRETION
METABOLISM OF QUINALDINE(2-METHYL-QUINOLINE). UPTAKE AND EXCRETION BY NURSE SHARKS,
W71-06324 05C

EXPERIMENTAL DATA
INITIAL EXPERIENCES ON THE 765 KV SYSTEM OF THE AMERICAN ELECTRIC POWER COMPANY (USA),
W71-05913 08C

EXTENDED AERATION
DEVELOPMENT OF DESIGN PARAMETERS FOR INTERSTATE REST AREA SEWAGE TREATMENT SYSTEMS,
W71-06040 05D

EXTERNALITIES
ORGANIZING WATER POLLUTION CONTROL THE SCOPE AND STRUCTURE OF RIVER BASIN AUTHORITIES,
W71-05936 06F

EXTERNALITIES, INFORMATION AND ALTERNATIVE COLLECTIVE ACTION,
W71-05964 06B

THE ORGANIZATION OF ECONOMIC ACTIVITY ISSUES PERTINENT TO THE CHOICE OF MARKET VERSUS NONMARKET ALLOCATION,
W71-05966 06C

EXTRA HIGH VOLTAGE
TRANSMISSION IN THE 70'S,
W71-05912 08C

INITIAL EXPERIENCES ON THE 765 KV SYSTEM OF THE AMERICAN ELECTRIC POWER COMPANY (USA),
W71-05913 08C

FABRICATION
GALVANIZED BETH-CU-LOY STEEL SHEETS - FOR CULVERT PIPE AND UNDERDRAINS.
W71-06419 08G

FARM MANAGEMENT
SOIL AND WATER LOANS LAND CONSERVATION AND DEVELOPMENT LOANS.
W71-06283 06E

FARM PROGRAM
THE ABSENCE OF KNOWLEDGE OF DISTRIBUTIONAL IMPACTS AN OBSTACLE TO EFFECTIVE POLICY ANALYSIS AND DECISIONS,
W71-05963 06B

FARM WASTE
AGRICULTURE WASTE RESEARCH NEEDS,
W71-06452 05D

FARM WASTES
EFFECT OF FEEDLOT LAGOON WATER ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF SOILS,
W71-05974 05C

ALTERNATIVES FOR THE TREATMENT AND DISPOSAL OF ANIMAL WASTES,
W71-06044 05D

INTRODUCTION ISSUES IN FOOD PRODUCTION AND CLEAN WATER,
W71-06429 05G

OXIDATION DITCH TREATMENT OF SWINE WASTES, SUMMARY REPORT,
W71-06442 05D

ALLIANCE FOR ACTION,
W71-06448 05G

ANAEROBIC DECOMPOSITION OF SWINE EXCREMENT,
W71-06453 05D

USE ANIMAL MANURE EFFECTIVELY,
W71-06454 05D

EFFECT OF SOIL TEMPERATURE ON THE AVAILABILITY OF PHOSPHORUS IN ANIMAL MANURES,
W71-06455 05C

FATTY ACIDS
ENVIRONMENTALLY-INDUCED CHANGES IN THE FATTY ACIDS OF CHLORELLA,
W71-05992 02I

THE INFLUENCE OF ACCLIMATION TEMPERATURE ON THE LIPID COMPOSITION OF FISH GILL MITOCHONDRIA,
W71-06321 05C

FEDERAL GOVERNMENT
NAVIGATION AND NAVIGABLE WATERS,
W71-06049 06E

VIEWS OF THE GOVERNORS ON TAX INCENTIVES AND EFFLUENT CHARGES (WATER POLLUTION CONTROL AND ABATEMENT).
W71-06052 05G

THE WOODSMAN'S ASSAULTS ON THE DOMAIN OF THE CATTLEMAN,
W71-06072 03F

FEDERAL JURISDICTION
WATER-USE LAW AND ADMINISTRATION IN WISCONSIN,
W71-06192 06E

FEDERAL POWER ACT
APPALACHIAN ELECTRIC POWER CO V SMITH (CONSTITUTIONALITY OF HYDROELECTRIC PROJECT LICENSING).
W71-05977 06E

APPALACHIAN ELECTRIC POWER CO V SMITH (FEDERAL POWER COMMISSION'S POWER TO REGULATE PROJECTS ON NON-NAVIGABLE RIVERS).
W71-06183 06E

FEDERAL WATER POLLUTION CONTROL ACT
WATER QUALITY STANDARDS.
W71-06054 05G

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
ACCOMPLISHMENTS AND GOALS,
W71-06449 05G

FEED LOT INDUSTRY
IMPLICATIONS OF WATER QUALITY LAWS FOR THE FEEDLOT INDUSTRY,
W71-06222 05G

FEED YARDS ACT
IMPLICATIONS OF WATER QUALITY LAWS FOR THE FEEDLOT INDUSTRY,
W71-06222 05G

FEEDLOTS
ANIMAL WASTE RUNOFF--A MAJOR WATER QUALITY CHALLENGE,
W71-06114 05B

INTRODUCTION ISSUES IN FOOD PRODUCTION AND CLEAN WATER,
W71-06429 05G

ALLIANCE FOR ACTION,
W71-06448 05G

FELDSPARS
THE QUALITATIVE DISTRIBUTION OF FELDSPARS IN SURFICIAL BOTTOM SEDIMENTS FROM LAKE ONTARIO,
W71-05889 02J

FERRIC CHLORIDE
FE CL3 ADDITION EXPERIMENTS FOR IMPROVED EFFLUENT QUALITY AT THE CALUMET TREATMENT PLANT, INTERIM REPORT,
W71-05927 05D

FERTILIZER USE
FERTILIZER MANAGEMENT FOR POLLUTION CONTROL,
W71-06437 05G

FERTILIZERS
POLLUTION - ARE FERTILIZERS AT FAULT,

W71-05996 05B

HOW TO SELECT AND APPLY ZINC FERTILIZER,
W71-06059 03F

FERTILIZER MANAGEMENT FOR POLLUTION CONTROL,
W71-06437 05G

USE ANIMAL MANURE EFFECTIVELY,
W71-06454 05D

FIBERGLAS REINFORCED PLASTICS
TANKS.
W71-06421 08G

FIBERGLASS PIPE
GLASS FIBER-REINFORCED PLASTICS PIPES FOR WATER PIPELINES,
W71-06291 08G

FIBERGLASS WINS PIPELINE,
W71-06300 08G

FIELD WATER-ANALYSIS KIT
A PORTABLE MULTIPARAMETER WATER QUALITY KIT,
W71-06157 05A

FILTER CLOGGING
PENETRATION IN A GRADED FILTER,
W71-06151 08B

FILTERS
PENETRATION IN A GRADED FILTER,
W71-06151 08B

FILTRATION
TREATMENT OF FISH HATCHERY EFFLUENT FOR RECYCLE,
W71-06024 05D

PENETRATION IN A GRADED FILTER,
W71-06151 08B

SOME ASPECTS OF SEWAGE TREATMENT AT COVENTRY,
W71-06366 05D

FINANCIAL RESPONSIBILITY
CERTIFICATES OF FINANCIAL RESPONSIBILITY (OIL POLLUTION).
W71-06276 06E

FISH
CRUSTACEANS AND FISHES IN THE SEA GRANT PONDS,
W71-06016 02L

PRELIMINARY PROCESS DESIGN AND TREATABILITY STUDIES OF FISH PROCESSING WASTES,
W71-06035 05D

TEMPERATURE SELECTION AND HEAT RESISTANCE OF THE MOSQUITO FISH, GAMBUSIA AFFINIS,
W71-06180 05C

FISH BEHAVIOR
AN ELECTRODE CHAMBER FOR RECORDING RESPIRATORY AND OTHER MOVEMENTS OF FREE-SWIMMING ANIMALS,
W71-06328 05A

FISH DIETS
'KEROSENE' TAINT IN SEA MULLET (MUGIL CEPHALUS LINNAEUS),
W71-06185 05C

FISH FOOD ORGANISMS
SOME EFFECTS OF ANTIMYCIN IN AN OLIGOTROPHIC LAKE,
W71-06323 05C

FISH GILL MITOCHONDRIA
THE INFLUENCE OF ACCLIMATION TEMPERATURE ON THE LIPID COMPOSITION OF FISH GILL MITOCHONDRIA,
W71-06321 05C

FISH HANDLING FACILITIES
PRELIMINARY PROCESS DESIGN AND TREATABILITY STUDIES OF FISH PROCESSING WASTES,
W71-06035 05D

FISH HATCHERIES
TREATMENT OF FISH HATCHERY EFFLUENT FOR RECYCLE,
W71-06024 05D

FISH PARASITES
A POTENTIAL CONTROL FOR LEECHES,
W71-06322 05C

FISH PHYSIOLOGY
LACTIC AND PYRUVIC ACID CHANGES IN BLUEGILL SUNFISH (LEPOMIS MACROCHIRUS RAFINESQUE) DURING GRADUAL HYPOXIA AT TWO ACCLIMATION TEMPERATURES (5 AND 20C),
W71-06320 05C

THE INFLUENCE OF ACCLIMATION TEMPERATURE ON THE LIPID COMPOSITION OF FISH GILL MITOCHONDRIA,
W71-06321 05C

EFFECTS OF ALKYL BENZENE SULFONATE ON RAINBOW TROUT,
W71-06325 05C

AN ELECTRODE CHAMBER FOR RECORDING RESPIRATORY AND OTHER MOVEMENTS OF FREE-SWIMMING ANIMALS,
W71-06328 05A

FISHKILL
SOME EFFECTS OF ANTIMYCIN IN AN OLIGOTROPHIC LAKE,
W71-06323 05C

FIXATION
CHEMISTRY OF NITROGEN IN SOILS,
W71-06436 05B

FLASH DISTILLATION
FIRST ANNUAL REPORT - OPERATION OF THE MULTI-EFFECT MULTI-STAGE FLASH DISTILLATION PLANT (CLAIR ENGLE), SAN DIEGO, CALIFORNIA.
W71-06241 03A

SECOND ANNUAL REPORT - OPERATION OF THE MULTI-EFFECT MULTI-STAGE FLASH DISTILLATION PLANT (CLAIR ENGLE), SAN DIEGO, CALIFORNIA.
W71-06242 03A

FLINT
MASTER PLAN FOR THE DEVELOPMENT OF WATER DISTRIBUTION FACILITIES FOR GENESEE COUNTY, ENGINEERING REPORT.
W71-05933 08A

GENESEE COUNTY ENVIRONMENTAL HEALTH, CONCLUSIONS REPORT, GENESEE COUNTY, MICHIGAN.
W71-05934 05B

FLOC FORMING BACTERIA
ALDRIN REMOVAL FROM LAKE WATER BY FLOCCULENT BACTERIA,
W71-06000 05G

FLOCCULATION
FE CL3 ADDITION EXPERIMENTS FOR IMPROVED EFFLUENT QUALITY A THE CALUMET TREATMENT PLANT, INTERIM REPORT,
W71-05927 05D

ALDRIN REMOVAL FROM LAKE WATER BY FLOCCULENT BACTERIA,
W71-06000 05G

DEVELOPMENT OF NEUTRON ACTIVATION FOR INVESTIGATION OF WATER CLARIFICATION,
W71-06265 05D

CLEANING OUR ENVIRONMENT-THE CHEMICAL BASIS FOR ACTION SECTION 2 - THE WATER ENVIRONMENT MUNICIPAL WASTE WATER TREATMENT.
W71-06415 05D

FLOOD CONTROL
A CRITICAL SURVEY OF USE OF COST-BENEFIT ANALYSIS IN PUBLIC C FINANCE,
W71-05948 06C

THE SOCIAL AND ECONOMIC NEED FOR FLOODPLAIN REGULATION,
W71-06131 04A

DELAWARE RIVER BASIN COMM'N HEARING TO EXPAND THE COMPREHENSIVE PLAN.
W71-06274 06E

PROBLEM OF FLOOD-CONTROL IN SMALL BASINS,
W71-06298 07C

FLOOD DAMAGE
FLOOD PLAIN INFORMATION, ELBA, ALABAMA, PEA RIVER, WHITE WATER AND BEAVER DAM CREEKS.
W71-05867 04A

FLOOD PLAIN INFORMATION, CALLEGUAS CREEK, VICINITY OF MOORPARK, VENTURA COUNTY, CALIFORNIA.
W71-05868 04A

FLOOD PLAIN INFORMATION, KINGFISHER AND UNCLE JOHN'S CREEKS, KINGFISHER, OKLAHOMA.
W71-06119 04A

THE SOCIAL AND ECONOMIC NEED FOR FLOODPLAIN REGULATION,
W71-06131 04A

YIELD REDUCTION BY CONTROLLED FLOODING OF CORN,
W71-06152 03F

FLOOD PLAIN INFORMATION, ONTONAGON RIVER, ONTONAGON, MICHIGAN, AND LAKE SUPERIOR SHORELINE, ONTONAGON COUNTY, MICHIGAN.
W71-06232 04A

WASHED-OUT PLATE CULVERT RESET IN 17-TON SECTIONS BY CRANE.
W71-06336 08A

FLOOD FORECASTING
THE AUTOMATIC HYDROLOGICAL RADIO REPORTING NETWORK, NEW ENGLAND DIVISION, CORPS OF ENGINEERS,
W71-06149 07A

FLOOD PLAIN ZONING
THE SOCIAL AND ECONOMIC NEED FOR FLOODPLAIN REGULATION,
W71-06131 04A

FLOOD PLAINS
FLOOD PLAIN INFORMATION, ELBA, ALABAMA, PEA RIVER, WHITE WATER AND BEAVER DAM CREEKS.
W71-05867 04A

FLOOD PLAIN INFORMATION, CALLEGUAS CREEK, VICINITY OF MOORPARK, VENTURA COUNTY, CALIFORNIA.
W71-05868 04A

FLOOD PLAIN INFORMATION, KINGFISHER AND UNCLE JOHN'S CREEKS, KINGFISHER, OKLAHOMA.
W71-06119 04A

THE SOCIAL AND ECONOMIC NEED FOR FLOODPLAIN REGULATION,

W71-06131 04A

FLOODING
GEORGE F FISH FARMS V STATE (STATE'S LIABILITY FOR FLOODING FARM).
W71-06163 06E

JONES V LOUISVILLE AND NASHVILLE RY (RECOVERY FOR FLOOD DAMAGE BY CONTRIBUTOR THERETO).
W71-06303 06E

FLOODS
FLOOD PLAIN INFORMATION, ELBA, ALABAMA, PEA RIVER, WHITE WATER AND BEAVER DAM CREEKS.
W71-05867 04A

FLOOD PLAIN INFORMATION, CALLEGUAS CREEK, VICINITY OF MOORPARK, VENTURA COUNTY, CALIFORNIA.
W71-05868 04A

FLOOD PLAIN INFORMATION, KINGFISHER AND UNCLE JOHN'S CREEKS, KINGFISHER, OKLAHOMA.
W71-06119 04A

VENICE IS SINKING INTO THE SEA,
W71-06120 02F

FLOODS FROM SMALL DRAINAGE AREAS IN CALIFORNIA-A COMPILATION OF PEAK DATA OCTOBER 1958 TO SEPTEMBER 1969,
W71-06127 07C

THE SOCIAL AND ECONOMIC NEED FOR FLOODPLAIN REGULATION,
W71-06131 04A

FLOOD PLAIN INFORMATION, ONTONAGON RIVER, ONTONAGON, MICHIGAN, AND LAKE SUPERIOR SHORELINE, ONTONAGON COUNTY, MICHIGAN.
W71-06232 04A

FLORIDA
EUTROPHICATION CAUSE--EFFECT RELATIONSHIPS,
W71-06009 05C

SALINE ARTESIAN WATER AS A SUPPLEMENT,
W71-06124 03C

WATER QUALITY AT THE DADE-COLLIER TRAINING AND TRANSITION AIRPORT, MIAMI INTERNATIONAL AIRPORT, AND COTTONMOUTH CAMP-EVERGLADES NATIONAL PARK, FLORIDA, NOVEMBER, 1969,
W71-06158 05A

FLOW
RADIAL WATER AND SOLUTE FLOWS IN ROOTS OF ZEA MAYS I. WATER FLOW,
W71-06064 02I

SEEPAGE FACE EFFECTS IN UNSTEADY GROUNDWATER FLOW,
W71-06190 02F

FLOW AROUND OBJECTS
TURBULENT FRICTION IN ECCENTRIC ANNULAR CONDUITS,
W71-06402 08B

FLOW CHARACTERISTICS
WATER TREATMENT - A GUIDE TO THE TREATMENT OF WATER AND EFFLUENTS PURIFICATION CHAPTER 13 - INTRODUCTORY SEWER SYSTEMS--OVERFLOWS-CONSERVANCY,
W71-06371 05D

INCREASING SEWAGE FLOW VELOCITY BY USING CHEMICAL ADDITIVES,
W71-06400 08B

FLOW CONTROL
PLASTICS IN WATER AND SEWAGE CONTROL,
W71-06286 08G

FLOW MEASUREMENT
VELOCITY MEASUREMENTS IN SEWERS VITAL TO DESIGN AND MAINTENANCE,
W71-06394 08B

FLOW PROFILES
HORIZONTAL TRANSPORT IN A ROTATING BASIN OF PARABOLIC DEPTH PROFILE,
W71-05903 02E

FLOW RATES
INCREASING SEWAGE FLOW VELOCITY BY USING CHEMICAL ADDITIVES,
W71-06400 08B

FLOW RESISTANCE
CANAL CAPACITY STUDIES MAIN CANAL COLUMBIA BASIN PROJECT,
W71-06109 04A

THE MECHANISM OF DIRECT RUNOFF FROM RAINFALL,
W71-06264 02G

FLOWERING
PHYSIOLOGY OF BOLL SHEDDING IN COTTON IV. CORRELATION STUDIES ON FLOWER PRODUCTION AND BOLL SHEDDING IN RELATION TO TEMPERATURE AND RAINFALL,
W71-06056 03F

FLOWMETERS
THE LE ACOUSTIC FLOWMETER - AN APPLICATION TO DISCHARGE MEASUREMENT,
W71-06293 08B

FLUCTUATION
OBSERVATIONS ON FLUCTUATIONS IN THE ABUNDANCE OF PLANKTON IN RELATION TO CERTAIN HYDROLOGICAL CONDITIONS OF RIVER GANGA,
W71-06004 02I

FLUID MECHANICS
RESONANCE IN PRESSURIZED PIPING SYSTEMS,
W71-05905 08B

FLUMES
REPORT ON TRAPEZOIDAL FLUME MODEL.
W71-05929 08B

FLUORESCENCE
THE USE OF CONCENTRATIONS OF ELECTROLYTES AND NATURALLY FLUORESCENT MATERIALS TO STUDY WATER MASS MOVEMENTS IN A FRESHWATER 'ESTUARY',
W71-05877 02L

FLUSHING
EUTROPHICATION STUDIES OF A SHALLOW INLET ON VANCOUVER ISLAND,
W71-05988 02L

FLUX
STUDY AND EXPERIMENTS IN WASTE WATER RECLAMATION BY REVERSE OSMOSIS,
W71-06025 05D

FOAM SEPARATION
FOAM SEPARATION PROCESSES FROM INDUSTRIAL WASTE TREATMENT PHENOL, PHOSPHATE, AND HEXAVALENT CHROMIUM,
W71-06194 05D

FOOD HABITS
A PRELIMINARY STUDY OF THE FEEDING RELATIONSHIPS OF FISH IN A HARD-WATER AND A SOFT-WATER STREAM IN SOUTHERN ENGLAND,
W71-06327 05C

FOODS
STUDIES OF MARINE ESTUARINE ECOSYSTEMS DEVELOPING WITH TREATED SEWAGE WASTES,
W71-06012 02L

THE ABSORPTION OF MERCURY FROM FOOD, ITS SIGNIFICANCE AND NEW METHODS OF REMOVING MERCURY FROM THE BODY,
W71-06080 05C

FORAGES
ESTABLISHMENT OF PERENNIAL FORAGES I. SUBSEQUENT YIELDS II. SUBSEQUENT ROOT DEVELOPMENT,
W71-06215 03F

FORECASTING
A CRITICAL SURVEY OF USE OF COST-BENEFIT ANALYSIS IN PUBLIC FINANCE,
W71-05948 06C

WATER QUALITY MODELING AND PREDICTION,
W71-06186 05G

FOREIGN COUNTRIES
DEVELOPMENT OF WATER RESOURCES IN ASIA AND THE FAR EAST-REPORT OF THE NINTH SESSION OF THE BIENNIAL REGIONAL CONFERENCE ON WATER RESOURCES DEVELOPMENT.
W71-05864 06B

FOREST FIRES
REPORT ON TRAPEZOIDAL FLUME MODEL.
W71-05929 08B

FOREST SOILS
THE UPLAND FOREST VEGETATION OF THE BOIS BRULE RIVER BASIN, TRIBUTARY TO LAKE SUPERIOR,
W71-05987 02J

FORESTS
REPORT ON BIOLOGICAL, CHEMICAL, AND GEOLOGICAL STUDIES OF BOIS BRULE AND POPLAR RIVER WATERSHEDS,
W71-05986 05C

THE UPLAND FOREST VEGETATION OF THE BOIS BRULE RIVER BASIN, TRIBUTARY TO LAKE SUPERIOR,
W71-05987 02J

FORMULATION
DEVELOPMENT OF PHOSPHATE-FREE HOME LAUNDRY DETERGENTS,
W71-06247 05G

FOULING
POSSIBILITY OF STUDYING THE EFFECTS OF POLLUTION ON BENTHIC ORGANISMS EMPLOYING IMMERSED PANELS (IN FRENCH),
W71-06205 05C

FOUNDATIONS
SETTLEMENT PROBLEM ORIENTED COMPUTER LANGUAGE,
W71-05915 08D

FRACTURES(GEOLOGY)
FORMATION EVALUATION BY INSPECTION WITH THE BOREHOLE TELEVIEWER,
W71-05916 07B

FREE SURFACE
SEEPAGE FACE EFFECTS IN UNSTEADY GROUNDWATER FLOW,
W71-06190 02F

FRESHWATER FISH
DISSOLVED OXYGEN CRITERIA FOR THE PROTECTION OF FISH,
W71-06182 05C

FUNGI
FUNGAL SURVEY IN WASTE PONDS AND CREEK,
W71-06013 02L

FUSION WELDING
PLASTIC MAY BE PIPELINER'S BOON.
W71-06339 08G

GAGING STATIONS
STATISTICAL SUMMARIES OF NEW JERSEY STREAMFLOW RECORDS,
W71-06228 07C

GALVESTON
ISLAND CITY SOLVES TOUGH SEWERAGE PROBLEM.
W71-06346 08A

GANGES RIVER(INDIA)
OBSERVATIONS ON FLUCTUATIONS IN THE ABUNDANCE OF PLANKTON IN RELATION TO CERTAIN HYDROLOGICAL CONDITIONS OF RIVER GANGA,
W71-06004 02I

GARBAGE DISPOSAL
SPECIAL STUDIES OF A SANITARY LANDFILL,
W71-06103 05B

GEESE(WILD)
EFFECTS OF OIL POLLUTION ON WATERFOWL A STUDY OF SALVAGE METHODS,
W71-05983 05C

GENESEE COUNTY
MASTER PLAN FOR THE DEVELOPMENT OF WATER DISTRIBUTION FACILITIES FOR GENESEE COUNTY, ENGINEERING REPORT.
W71-05933 08A

GENESEE COUNTY ENVIRONMENTAL HEALTH, CONCLUSIONS REPORT, GENESEE COUNTY, MICHIGAN.
W71-05934 05B

GEOCHEMISTRY
GEOCHEMICAL SURVEY OF MISSOURI, PLANS AND PROGRESS FOR FIRST SIX-MONTH PERIOD (JULY-DECEMBER, 1969).
W71-05874 02K

GEOLOGIC INVESTIGATION
GEOCHEMICAL SURVEY OF MISSOURI, PLANS AND PROGRESS FOR FIRST SIX-MONTH PERIOD (JULY-DECEMBER, 1969).
W71-05874 02K

GEOLOGIC INVESTIGATIONS
GEOCHEMICAL SURVEY OF MISSOURI, PLANS AND PROGRESS FOR SECOND SIX-MONTH PERIOD (JANUARY-JUNE, 1970).
W71-05854 02K

GEOLOGY
GEOCHEMICAL SURVEY OF MISSOURI, PLANS AND PROGRESS FOR FIRST SIX-MONTH PERIOD (JULY-DECEMBER, 1969).
W71-05874 02K

GEOMORPHOLOGY
THE ORIGIN OF THE LABYRINTH, WRIGHT VALLEY, ANTARCTICA,
W71-05847 02J

GEOPHYSICAL PROSPECTING
FORMATION EVALUATION BY INSPECTION WITH THE BOREHOLE TELEVIEWER,
W71-05916 07B

GEORGE NARROWS(CANADA)
EUTROPHICATION STUDIES OF A SHALLOW INLET ON VANCOUVER ISLAND,
W71-05988 02L

GEOSTROPHIC FLOW
JULY CURRENTS NEAR THE SOUTH SHORE OF LAKE ONTARIO,
W71-05978 02H

GERMANY
PLASTIC MAY BE PIPELINER'S BOON.
W71-06339 08G

OVERFLOW STUDIES AT A SEWER SYSTEM OF A METROPOLITAN CITY,
W71-06373 08B

THE DISCHARGE OF STORM SEWAGE TO PUBLIC WATERS FROM AREAS OF GROUNDS WHICH ARE ENDANGERED BY OIL, IN CONNECTION WITH THE CLEAN WATER ACT FOR BERLIN,
W71-06388 05D

GILA RIVER(ARIZ
WATER CONSERVATION BY REMOVAL OF PHREATOPHYTES,
W71-06154 03B

GOVERNMENT
ECONOMIC ANALYSIS IN NATURAL RESOURCE PROGRAMS,
W71-05940 06B

THE FISCAL ECONOMIST AND QUANTITATIVE ANALYSIS,
W71-05956 06C

MEASURING EFFICIENCY IN GOVERNMENT SERVICES,
W71-05957 06B

THE ROLE OF INCENTIVES, PENALTIES, AND REWARDS IN ATTAINING EFFECTIVE POLICY,
W71-05959 06B

COLLECTIVE ACTION AND THE DISTRIBUTION OF INCOME A CONCEPTUAL APPROACH,
W71-05960 06C

INSTITUTIONAL OBSTACLES TO REALLOCATING GOVERNMENT EXPENDITURES,
W71-05961 06B

THE ABSENCE OF KNOWLEDGE OF DISTRIBUTIONAL IMPACTS AN OBSTACLE TO EFFECTIVE POLICY ANALYSIS AND DECISIONS,
W71-05963 06B

GRADED FILTER BEDS
PENETRATION IN A GRADED FILTER,
W71-06151 08B

GRAND COULEE POWERPLANT
GRAND COULE THIRD POWERPLANT NOISE CONTROL STUDY,
W71-06329 08C

GRANTS
GRANTS FOR PREPARATION OF COMPREHENSIVE AREA PLANS FOR WATE AND SEWER SYSTEMS.
W71-06284 06A

GRAPHICAL ANALYSIS
STABILITY OF ROCK SLOPES--GRAPHICAL METHODS,
W71-05909 02E

GRASSLANDS
DENSITIES OF PRAIRIE SNOWPACKS,
W71-06137 02C

GRAVELS
THE MATTHES ROLLING DIAMETER AS AN INDICATOR OF CHANNEL STABILITY,
W71-06169 02J

GRAVITY SEWER
STORM WATER TREATMENT AT CLEVELAND,
W71-06389 05D

GREAT BASIN
WATER-RESOURCES APPRAISAL OF THE COLUMBUS SALT MARSH-SODA SPRING VALLEY AREA, MINERAL AND ESMERALDA COUNTIES, NEVADA,
W71-05862 04B

GREAT BRITAIN
ANGLESEY ALUMINUM SEA OUTFALL,
W71-06289 08A

INTERNATIONAL BUILDING EXHIBITION - OLYMPIA LONDON 13-25 NOVEMBER 1969.
W71-06348 08A

SEWERS UNDER ATTACK.
W71-06349 08G

ALUMINUM PIPELINE FOR SEA OUTFALL SEWER.
W71-06355 08G

SUSPENDED SEWAGE PIPELINE.
W71-06356 08A

TRENCHLESS PIPELAYING DEMONSTRATED.
W71-06358 08C

GREAT LAKES
SURFACE WATER INPUTS OF IODINE, BROMINE, AND CHLORINE TO LAKE HURON,
W71-05882 05B

DISSOLVED MINERAL QUALITY OF GREAT LAKES WATERS,
W71-05883 05A

ESTIMATES OF MONTHLY EVAPORATION LOSSES FROM THE GREAT LAKES 1950 TO 1968 BASED ON THE MASS TRANSFER TECHNIQUE,
W71-05892 02D

SMALL-SCALE MODEL OF THE 'THERMAL BAR',
W71-05895 02H

HYDRAULIC AND WIND-INDUCED CIRCULATION IN A MODEL OF A GREAT LAKE,
W71-05897 02H

SOME UNUSUAL SURFACE WATER TEMPERATURE PATTERNS IN THE GREAT LAKES, AS DETECTED BY AIRBORNE RADIATION THERMOMETER SURVEYS,
W71-05898 07B

WATER POLLUTION PROBLEMS AND CONTROL PROGRAMS IN MICHIGAN'S PORTION OF THE GREAT LAKES.
W71-06053 05G

GREAT MIAMI RIVER BASIN(OHIO)
POTENTIAL FOR STREAMFLOW AUGMENTATION BY GROUNDWATER PUMPING,
W71-06118 04B

GREEN RIVER
HYDROLOGIC INVENTORY OF THE UINTAH STUDY UNIT,
W71-06219 02E

GREEN RIVER BASIN(WYOMING)
GROUNDWATER RECONNAISSANCE OF THE GREEN RIVER BASIN, SOUTHWESTERN WYOMING,
W71-05902 07C

GROUNDWATER
RADIOCHEMICAL ANALYSES OF WATER FROM SELECTED STREAMS, WELLS, SPRINGS, AND PRECIPITATION COLLECTED PRIOR TO REENTRY DRILLING, PROJECT RULISON,
W71-05842 05A

WATER RESOURCES OF NASSAU AND SUFFOLK COUNTIES,
W71-05843 03D

GROUNDWATER RESOURCES OF THE LOYSVILLE AND MIFFLINTOWN QUADRANGLES IN SOUTH-CENTRAL PENNSYLVANIA,
W71-05853 04B

GROUNDWATER RECONNAISSANCE OF THE GREEN RIVER BASIN, SOUTHWESTERN WYOMING,
W71-05902 07C

ANIMAL WASTE RUNOFF--A MAJOR WATER QUALITY CHALLENGE,
W71-06114 05B

SEVENTH BIENNIAL CONFERENCE ON GROUNDWATER (PROGRESS, PRACTICE, AND POTENTIAL OF GROUNDWATER RECHARGE, DEVELOPMENT AND MANAGEMENT).
W71-06117 04B

POTENTIAL FOR STREAMFLOW AUGMENTATION BY GROUNDWATER PUMPING,
W71-06118 04B

NITRATE POLLUTION OF WATER,
W71-06130 05B

PRELIMINARY REPORT ON THE WATER RESOURCES OF THE WAILUKU AREA,
W71-06155 02E

GROUNDWATER RESOURCES OF NELSON COUNTY, NORTHEASTERN NORTH DAKOTA,
W71-06160 07C

AVAILABILITY OF GROUNDWATER IN CHARLES COUNTY, MARYLAND,
W71-06168 02F

AVAILABILITY OF GROUNDWATER IN DECATUR COUNTY, IOWA,
W71-06175 02F

WELL RECORDS, DEPTH-TO-WATER MEASUREMENTS, CHEMICAL ANALYSES OF GROUND WATER, DRILLERS LOGS, AND ELECTRIC-LOG INFORMATION IN HEMPSTEAD, LAFAYETTE, LITTLE RIVER, MILLER, AND NEVADA COUNTIES, ARKANSAS,
W71-06229 04B

YORK RIVER BASIN COMPREHENSIVE WATER RESOURCES PLAN-VOLUME 1, INTRODUCTION.
W71-06230 06B

YORK RIVER BASIN COMPREHENSIVE WATER RESOURCES PLAN, VOLUME III-HYDROLOGIC ANALYSIS,
W71-06231 06B

GROUNDWATER RESOURCES
GROUNDWATER RESOURCES OF THE LOYSVILLE AND MIFFLINTOWN QUADRANGLES IN SOUTH-CENTRAL PENNSYLVANIA,
W71-05853 04B

GROUNDWATER RESOURCES(NELSON COUNTY
GROUNDWATER RESOURCES OF NELSON COUNTY, NORTHEASTERN NORTH DAKOTA,
W71-06160 07C

GUIDANCE SYSTEM
TRENCHER AND BOX SHIELD MAKE SEWER JOB ALMOST ONE-RIG CPERATION.
W71-06334 08C

GULF OF MEXICO
DEPOSITIONAL SEQUENCES AND SAND DISTRIBUTION IN THE POSTGLACIAL RHONE DELTA COMPLEX,
W71-05857 02J

SEDIMENTATION IN A MALAYSIAN HIGH TIDE TROPICAL DELTA,
W71-05858 02J

FACIES AND DEVELOPMENT OF THE COLORADO RIVER DELTA IN TEXAS,
W71-05860 02J

HALOGENS
SURFACE WATER INPUTS OF IODINE, BROMINE, AND CHLORINE TO LAKE HURON,
W71-05882 05B

HALOPHYTES
THE ROLE OF SUCCULENT HALOPHYTES IN THE WATER BALANCE OF SALT MARSH RODENTS,
W71-06073 02I

HANGERS
TURBULENT FRICTION IN ECCENTRIC ANNULAR CONDUITS,
W71-06402 08B

HARBOR LINES
NAVIGATION AND NAVIGABLE WATERS,
W71-06049 06E

HARBORS
WATERFRONT LAND USE IN THE AUSTRALIAN STATE CAPITALS,
W71-06065 06B

HARDNESS(WATER)
A PRELIMINARY STUDY OF THE FEEDING RELATIONSHIPS OF FISH IN A HARD-WATER AND A SOFT-WATER STREAM IN SOUTHERN ENGLAND,
W71-06327 05C

HARVESTING OF ALGAE
PHYSICAL PROPERTIES AND PROCESSING CHARACTERISTICS OF MACROPHYTES AS RELATED TO MECHANICAL HARVESTING,
W71-06188 04A

HAWAII
PRELIMINARY REPORT ON THE WATER RESOURCES OF THE WAILUKU AREA,
W71-06155 02E

ARTIFICIAL RECHARGE PRACTICES IN HAWAII,
W71-06263 04B

HAZARDOUS MATERIALS
ABSTRACT OF PROCEEDINGS, HAZARDOUS POLLUTING SUBSTANCES SYMPOSIUM ANNEX 1 TO STUDY ON CONTROL OF HAZARDOUS POLLUTING SUBSTANCES, SEPT. 14-16, 1970. NEW ORLEANS, LA.
W71-06270 05B

HEAD LOSS
CANAL CAPACITY STUDIES MAIN CANAL COLUMBIA BASIN PROJECT,
W71-06109 04A

TURBULENT FRICTION IN ECCENTRIC ANNULAR CONDUITS,
W71-06402 08B

HEAT FLOW
FORMATION OF THE THERMAL REGIME IN SOILS ON IRRIGATED FIELDS IN PERMAFROST REGIONS,
W71-06070 02G

HEAT RESISTANCE
TEMPERATURE SELECTION AND HEAT RESISTANCE OF THE MOSQUITO FISH, GAMBUSIA AFFINIS,
W71-06180 05C

HEAT TRANSFER
ONE-DIMENSIONAL OPEN CHANNEL HEAT DISPERSION,
W71-06085 05G

AN INTERFEROMETRIC TECHNIQUE FOR TEMPERATURE AND CONCENTRATION MEASUREMENT FOR AN AIR-WATER INTERFACE,
W71-06090 05A

TEMPERATURE CONTROL IN OUTDOOR EXPERIMENTAL PONDS,
W71-06093 05C

OAK RIDGE NATIONAL LABORATORY VERTICAL TUBE EVAPORATOR PILOT PLANT ANNUAL REPORT FOR FISCAL YEAR 1969.
W71-06243 03A

OAK RIDGE NATIONAL LABORATORY VERTICAL TUBE EVAPORATOR PILOT PLANT - ANNUAL REPORT FOR FISCAL YEAR 1970.
W71-06244 03A

HEAVY METALS
POLLUTION FROM MINES IN THE 'NEW LEAD BELT' OF SOUTH EASTERN MISSOURI,
W71-05837 05A

MERCURY USES IN CANADA AND THEIR POSSIBLE HAZARDS AS SOURCES OF MERCURY CONTAMINATION,
W71-05861 05B

TOXICITY OF ZINC, COPPER AND LEAD TO CHLOROPHYTA FROM FLOWING WATERS,
W71-05991 05C

BIOLOGICAL REACTIONS AND PATHOLOGICAL CHANGES OF HUMAN BEINGS AND ANIMALS UNDER THE CONDITION OF ORGANIC MERCURY CONTAMINATION,
W71-06076 05C

MAN-MADE SOURCES OF MERCURY,
W71-06077 05B

HEAVY METAL POLLUTION POLICY AND PROGRAM IMPLICATIONS FOR THE PROTECTION OF THE ECOSYSTEM,
W71-06078 05A

ACTIVITIES OF THE FOOD AND AGRICULTURE ORGANIZATION AND THE WORLD HEALTH ORGANIZATION REGARDING MERCURY,
W71-06079 05A

THE ABSORPTION OF MERCURY FROM FOOD, ITS SIGNIFICANCE AND NEW METHODS OF REMOVING MERCURY FROM THE BODY,
W71-06080 05C

EMBRYOTOXICITY OF MERCURY COMPOUNDS,
W71-06081 05C

THE FACTS BEHIND THE MERCURY,
W71-06100 05A

HERBICIDE DISSIPATION
HERBICIDE RESIDUES IN AGRICULTURAL WATER FROM CONTROL OF AQUATIC AND BANK WEEDS,
W71-06440 05B

HERBICIDES
THE EFFECTS OF THE HERBICIDES DIQUAT AND DICHLOBENIL (CASORON) ON POND INVERTEBRATES PART I. ACUTE TOXICITY,
W71-06181 05C

HERBICIDE RESIDUES IN AGRICULTURAL WATER FROM CONTROL OF AQUATIC AND BANK WEEDS,
W71-06440 05B

HEXAVALENT CHROMIUM
FOAM SEPARATION PROCESSES FROM INDUSTRIAL WASTE TREATMENT PHENOL, PHOSPHATE, AND HEXAVALENT CHROMIUM,
W71-06194 05D

HIGHER EDUCATION
THE ABSENCE OF KNOWLEDGE OF DISTRIBUTIONAL IMPACTS AN OBSTACLE TO EFFECTIVE POLICY ANALYSIS AND DECISIONS,
W71-05963 06B

HIGHWAYS
DEVELOPMENT OF DESIGN PARAMETERS FOR INTERSTATE REST AREA SEWAGE TREATMENT SYSTEMS,
W71-06040 05D

COUNTY OF BECKER V SHEVLIN LAND CO (RIGHT TO CONNECT NAVIGABLE STREAMS WITH HIGHWAYS).
W71-06099 06E

HOGS
ANAEROBIC DECOMPOSITION OF SWINE EXCREMENT,
W71-06453 05D

HUMAN PATHOLOGY
ACTIVITIES OF THE FOOD AND AGRICULTURE ORGANIZATION AND THE WORLD HEALTH ORGANIZATION REGARDING MERCURY,
W71-06079 05A

EMBRYOTOXICITY OF MERCURY COMPOUNDS,
W71-06081 05C

HYDRAULIC ANALYSIS
WHITHER WATER POLLUTION CONTROL,
W71-06370 05G

HYDRAULIC DESIGN
HYDRAULIC DESIGN OF SELF-CLEANING SEWAGE TUNNELS,
W71-06401 08B

HYDRAULIC ENGINEERING
PRACTICAL HYDRAULICS FOR PUBLIC WORKS ENGINEER,
W71-06398 08B

HYDRAULIC EQUIPMENT
TOOLS OF THE BUILDER.
W71-06335 08C

HYDRAULIC JUMP
EFFICIENCY OF HYDRAULIC JUMP,
W71-05850 08B

HYDRAULIC MODELS
FLAT-VEE WEIRS IN ALLUVIAL CHANNELS,
W71-05849 08B

HYDRAULIC TRENCHER
TRENCHER AND BOX SHIELD MAKE SEWER JOB ALMOST ONE-RIG OPERATION.
W71-06334 08C

HYDRAULICS
RESONANCE IN PRESSURIZED PIPING SYSTEMS,
W71-05905 08B

THE LE ACOUSTIC FLOWMETER - AN APPLICATION TO DISCHARGE MEASUREMENT,
W71-06293 08B

HYDROELECTRIC PLANTS
KIRK V MAUMEE VALLEY ELECTRIC CO (LEASE OF WATER RIGHTS IN CANAL SUBJECT TO STATE'S RIGHT TO ABANDON CANAL).
W71-06171 06E

HYDROELECTRIC POWER
COLGATE V PHILADELPHIA ELECTRIC POWER CO (CONSTITUTIONALITY OF CONDEMNATION OF PENNSYLVANIA LAND FOR OVERFLOW FROM MARYLAND DAM).
W71-06173 06E

HYDROGEN ION CONCENTRATION
EH AS AN OPERATIONAL PARAMETER IN ESTUARINE STUDIES,
W71-05873 02L

EFFECTS ON PH ON THE LIFE CYCLE OF THE MIDGE TANYTARSUS DISSIMILIS,
W71-05982 05C

REACTION RATES OF PHOTOSYNTHESIS,
W71-06039 05C

EFFECT OF TEMPERATURE ON THE PH OF SEAWATER,
W71-06167 02K

HYDROGEOLOGY
HYDROLOGY OF LIMESTONE TERRANES, PHOTOGEOLOGIC INVESTIGATIONS,
W71-05838 02F

GEOHYDROLOGY OF THE AREA NEAR WOSCO EXPLORATORY HOLE NUMBER 1, UINTAH COUNTY, UTAH,
W71-06153 08H

GROUNDWATER RESOURCES OF NELSON COUNTY, NORTHEASTERN NORTH DAKOTA,
W71-06160 07C

A GUIDE FOR CONTRACTORS ON THE CONSTRUCTION OF DRAINAGE SYSTEMS,
W71-06288 08A

HYDROGRAPH ANALYSIS
THE DESCHUTES RIVER HYDROGRAPH FORECAST,
W71-06144 04A

HYDROLOGIC ASPECTS
A HYDROLOGIC ANALYSIS OF THE NEW JERSEY PINE BARRENS REGION,
W71-06125 02A

HYDROLOGIC ATLAS
GROUNDWATER RESOURCES OF NELSON COUNTY, NORTHEASTERN NORTH DAKOTA,
W71-06160 07C

HYDROLOGIC BUDGET
HYDROLOGIC INVENTORY OF THE UTAH LAKE DRAINAGE AREA,
W71-06218 02E

HYDROLOGIC INVENTORY OF THE UINTAH STUDY UNIT,
W71-06219 02E

HYDROLOGIC INVENTORY OF THE WEBER RIVER STUDY UNIT,
W71-06220 02E

HYDROLOGIC DATA
GROUNDWATER RESOURCES OF THE LOYSVILLE AND MIFFLINTOWN QUADRANGLES IN SOUTH-CENTRAL PENNSYLVANIA,
W71-05853 04B

SUMMARY OF DATA ON TEMPERATURE OF STREAMS IN NORTH CAROLINA 1943-67,
W71-05855 07C

WATER-RESOURCES APPRAISAL OF THE COLUMBUS SALT MARSH-SODA SPRING VALLEY AREA, MINERAL AND ESMERALDA COUNTIES, NEVADA
W71-05862 04B

WATER RESOURCES DEVELOPMENT IN LAOS.
W71-05865 06B

WATER RESOURCES OF THE BLACK RIVER BASIN, SOUTHEASTERN MICHIGAN,
W71-05869 07C

GROUNDWATER RECONNAISSANCE OF THE GREEN RIVER BASIN, SOUTHWESTERN WYOMING,
W71-05902 07C

OBSERVATIONS ON FLUCTUATIONS IN THE ABUNDANCE OF PLANKTON RELATION TO CERTAIN HYDROLOGICAL CONDITIONS OF RIVER GANGA
W71-06004 02I

A HYDROLOGIC ANALYSIS OF THE NEW JERSEY PINE BARRENS REGIO
W71-06125 02A

A PROPOSED STREAMFLOW-DATA PROGRAM FOR NEBRASKA,
W71-06128 07A

USING ALL AVAILABLE HYDROLOGIC DATA,
W71-06138 07C

WATER QUALITY OF THE DELAWARE RIVER ESTUARY, JULY THROUGH DECEMBER 1967,
W71-06156 05A

AVAILABILITY OF GROUNDWATER IN DECATUR COUNTY, IOWA,
W71-06175 02F

WATER RELATED LAND USE IN THE BEAR RIVER DRAINAGE AREA,
W71-06212 07C

WATER RELATED LAND USE IN THE UTAH LAKE DRAINAGE AREA,
W71-06213 07C

HYDROLOGIC INVENTORY OF THE UTAH LAKE DRAINAGE AREA,
W71-06218 02E

HYDROLOGIC INVENTORY OF THE UINTAH STUDY UNIT,
W71-06219 02E

HYDROLOGIC INVENTORY OF THE WEBER RIVER STUDY UNIT,
W71-06220 02E

STATISTICAL SUMMARIES OF NEW JERSEY STREAMFLOW RECORDS,
W71-06228 07C

WELL RECORDS, DEPTH-TO-WATER MEASUREMENTS, CHEMICAL ANALYSES OF GROUND WATER, DRILLERS LOGS, AND ELECTRIC-LOG INFORMATION IN HEMPSTEAD, LAFAYETTE, LITTLE RIVER, MILLER, AND NEVADA COUNTIES, ARKANSAS,
W71-06229 04B

YORK RIVER BASIN COMPREHENSIVE WATER RESOURCES PLAN, VOLUME III-HYDROLOGIC ANALYSIS,
W71-06231 06B

HYDROLOGIC DATA NETWORK
THE AUTOMATIC HYDROLOGICAL RADIO REPORTING NETWORK, NEW ENGLAND DIVISION, CORPS OF ENGINEERS,
W71-06149 07A

HYDROLOGIC PROPERTIES
SOME FACTORS TO BE CONSIDERED IN THE DESIGN OF WASTE DISPOSAL WELLS,
W71-06199 05D

HYDROLOGY
A HYDROLOGIC ANALYSIS OF THE NEW JERSEY PINE BARRENS REGION,
W71-06125 02A

HYDROLYSIS
UREA CONVERSION TO AMMONIA IN WATERLOGGED SOILS,
W71-05866 02K

HYPERBOLIC COOLING TOWERS
FIELD INVESTIGATION OF ENVIRONMENTAL EFFECTS OF COOLING TOWERS FOR LARGE STEAM ELECTRIC PLANTS,
W71-05930 05D

HYPOLIMNION
INDUCED HYPOLIMNION AERATION FOR WATER QUALITY IMPROVEMENT OF POWER RELEASES,
W71-06251 05G

HYPOXIA
LACTIC AND PYRUVIC ACID CHANGES IN BLUEGILL SUNFISH (LEPOMIS MACROCHIRUS RAFINESQUE) DURING GRADUAL HYPOXIA AT TWO ACCLIMATION TEMPERATURES (5 AND 20C),
W71-06320 05C

ILLINOIS
STABILIZED BASE FOR RESIDENTIAL STREETS,
W71-06292 08F

IMPOUNDMENTS
INDUCED HYPOLIMNION AERATION FOR WATER QUALITY IMPROVEMENT OF POWER RELEASES,
W71-06251 05G

IMPOUNDMENTS ARKANSAS
DISTRIBUTION OF TRACE METALS IN IMPOUNDMENTS,
W71-05971 05B

IN SITU ROCK
STABILITY OF ROCK SLOPES--GRAPHICAL METHODS,
W71-05909 02E

INCENTIVES
THE ROLE OF INCENTIVES, PENALTIES, AND REWARDS IN ATTAINING EFFECTIVE POLICY,
W71-05959 06B

INCOME
COLLECTIVE ACTION AND THE DISTRIBUTION OF INCOME A CONCEPTUAL APPROACH,
W71-05960 06C

INDIAN RESERVATIONS
UNITED STATES V HAYES (TITLE TO STREAMBED FORMERLY PART OF INDIAN RESERVATION).
W71-06177 06E

INDICATORS
TOXICITY OF ZINC, COPPER AND LEAD TO CHLOROPHYTA FROM FLOWING WATERS,
W71-05991 05C

INDUCED AERATION
INDUCED HYPOLIMNION AERATION FOR WATER QUALITY IMPROVEMENT OF POWER RELEASES,
W71-06251 05G

INDUSTRIAL PLANTS
WATER REQUIREMENTS FOR MANUFACTURING,
W71-06318 06D

INDUSTRIAL WASTES
MERCURY USES IN CANADA AND THEIR POSSIBLE HAZARDS AS SOURCES OF MERCURY CONTAMINATION,
W71-05861 05B

TREATMENT OF ORGANIC INDUSTRIAL WASTES BY LAGOONING,
W71-06036 05D

TWENTY YEARS OF INDUSTRIAL WASTE TREATMENT,
W71-06037 05D

BIOLOGICAL CONCEPTS AND INDUSTRIAL WASTE DISPOSAL PROBLEMS,
W71-06038 05D

MAN-MADE SOURCES OF MERCURY,
W71-06077 05B

FOAM SEPARATION PROCESSES FROM INDUSTRIAL WASTE TREATMENT PHENOL, PHOSPHATE, AND HEXAVALENT CHROMIUM,
W71-06194 05D

WASTE REDUCTION IN FOOD CANNING OPERATIONS,
W71-06257 05D

ABSTRACT OF PROCEEDINGS, HAZARDOUS POLLUTING SUBSTANCES SYMPOSIUM ANNEX 1 TO STUDY ON CONTROL OF HAZARDOUS POLLUTING SUBSTANCES, SEPT. 14-16, 1970. NEW ORLEANS, LA.
W71-06270 05B

INDUSTRIAL WATER
WATER REQUIREMENTS FOR MANUFACTURING,
W71-06318 06D

INDUSTRIES
VIEWS OF THE GOVERNORS ON TAX INCENTIVES AND EFFLUENT CHARGES (WATER POLLUTION CONTROL AND ABATEMENT).
W71-06052 05G

INFILTRATION
CONTROL OF INFILTRATION IN SEWER SYSTEMS-DESIGN AND MAINTENANCE,
W71-06197 05D

LOW-PRESSURE AIR TESTS FOR SEWER LINES,
W71-06299 08A

INFILTRATION IN SEWERS,
W71-06403 08A

INFLATION
A NOTE ON BIASES IN CAPITAL BUDGETING INTRODUCED BY INFLATION,
W71-05969 06C

INFRARED RADIATION
INFRARED PHOTOS CAN MAP SOILS,
W71-06058 07B

INFRA-RED
CHARACTERIZATION OF OIL SLICKS ON SURFACE WATERS,
W71-06261 05A

INJECTION
SOME FACTORS TO BE CONSIDERED IN THE DESIGN OF WASTE DISPOSAL WELLS,
W71-06199 05D

INLAND WATERWAYS
REGENERATION OF THE SEVAN,
W71-06330 02H

INPUT-OUTPUT ANALYSIS
MEASURING EFFICIENCY IN GOVERNMENT SERVICES,
W71-05957 06B

INSECTICIDES
CHEMISTRY AND METABOLISM OF INSECTICIDES,
W71-06438 05C

INSPECTION
TV INSPECTION AND IN-PLACE GROUTING OF SEWERS,
W71-06427 07B

INSTALLATION
INSTALLATION OF SOIL, WASTE AND DRAINAGE PIPING IN FILL OR UNSTABLE SOIL,
W71-06285 08A

WASHED-OUT PLATE CULVERT RESET IN 17-TON SECTIONS BY CRANE.
W71-06336 08A

PLASTIC MAY BE PIPELINER'S BOON.
W71-06339 08G

SEWERS UNDER ATTACK.
W71-06349 08G

SEWER IMPROVEMENTS CALL FOR TRUNK.
W71-06353 08F

LASER BEAM AND POWDER-ACTUATED TOOL SPEED PIPE LAYING.
W71-06354 08C

ALUMINUM PIPELINE FOR SEA OUTFALL SEWER.
W71-06355 08G

SUSPENDED SEWAGE PIPELINE.
W71-06356 08A

UNDERWATER LINE SPANS 32 FEET BETWEEN SUPPORTS.
W71-06362 08F

INSULATED CO-AXIAL PIPELINES,
W71-06408 08G

INSTALLATION COSTS
STEEL STORM SEWER SAVES MONEY FOR PHOENIX,
W71-06406 08G

INSTITUTIONAL OBSTACLES
INSTITUTIONAL OBSTACLES TO REALLOCATING GOVERNMENT EXPENDITURES,
W71-05961 06B

INSTITUTIONS
INSTITUTIONAL FACTORS INFLUENCING WATER DEVELOPMENT IN TEXAS,
W71-05972 06B

INSTRUMENTATION
AN INTERFEROMETRIC TECHNIQUE FOR TEMPERATURE AND CONCENTRATION MEASUREMENT FOR AN AIR-WATER INTERFACE,
W71-06090 05A

THE SURFACE INSTRUMENT NETWORK OF THE UPPER COLORADO RIVER PILOT PROJECT,
W71-06136 07A

THE LE ACOUSTIC FLOWMETER - AN APPLICATION TO DISCHARGE MEASUREMENT,
W71-06293 08B

A GENERAL REVIEW OF CONTINUOUS WATER QUALITY ANALYSIS INSTRUMENTATION,
W71-06295 05B

HOW TO THINK ABOUT INSTRUMENTATION AND CONTROL,
W71-06409 05G

DENSE NETWORK FOR RAPID MEASUREMENT OF RAINFALL RATE,
W71-06410 02B

OPTIMIZING WASTE TREATMENT CONTROL SYSTEMS,
W71-06414 05D

DEVELOPMENTS IN SEWER MONITORING EQUIPMENT AND TECHNIQUES,
W71-06428 08B

INTANGIBLE BENEFITS
MEASURING INTANGIBLE BENEFITS--SOME NEEDED RESEARCH,
W71-06313 06B

INTEGRATED CONTROL MEASURES
GOVERNMENTAL RESPONSIBILITY FOR WASTE MANAGEMENT IN URBAN REGIONS,
W71-06282 05G

INTERBASIN TRANSFERS
INSTITUTIONAL FACTORS INFLUENCING WATER DEVELOPMENT IN

TEXAS,
W71-05972 06B

INTERCEPTION
WORK STARTS ON 11-MILE INTERCEPTOR TO SOLVE TORONTO'S SEWER PROBLEM.
W71-06337 08A

INTERCEPTOR SEWER
WORK STARTS ON 11-MILE INTERCEPTOR TO SOLVE TORONTO'S SEWER PROBLEM.
W71-06337 08A

STEPS TO SUCCESS IN WATER POLLUTION CONTROL,
W71-06379 05G

INTERCONNECTED SYSTEMS
TRANSMISSION IN THE 70'S,
W71-05912 08C

INTERFACES
STUDIES OF MARINE ESTUARINE ECOSYSTEMS DEVELOPING WITH TREATED SEWAGE WASTES,
W71-06012 02L

INTERNAL WAVES(LAKES)
INTERNAL WAVES OF THE SECOND VERTICAL MODE IN LAKE HURON,
W71-05896 02H

INTERNATIONAL COMMISSIONS
SNOW AND RESERVOIR MANAGEMENT IN CANADA FOR THE COLUMBIA RIVER TREATY OPERATION,
W71-06134 02C

INTERNATIONAL JOINT COMMISSION
SNOW AND RESERVOIR MANAGEMENT IN CANADA FOR THE COLUMBIA RIVER TREATY OPERATION,
W71-06134 02C

INTERSTATE COMMISSIONS
DELAWARE RIVER BASIN COMM'N HEARING TO EXPAND THE COMPREHENSIVE PLAN.
W71-06274 06E

HEARING BY DELAWARE RIVER BASIN COMM'N TO EXPAND THE COMPREHENSIVE PLAN.
W71-06275 05G

INTERSTATE COMPACTS
DELAWARE RIVER BASIN COMM'N HEARING TO EXPAND THE COMPREHENSIVE PLAN.
W71-06274 06E

HEARING BY DELAWARE RIVER BASIN COMM'N TO EXPAND THE COMPREHENSIVE PLAN.
W71-06275 05G

INTERSTATE HIGHWAY SYSTEM
DEVELOPMENT OF DESIGN PARAMETERS FOR INTERSTATE REST AREA SEWAGE TREATMENT SYSTEMS,
W71-06040 05D

INTERTEMPORAL ALLOCATION
AN ECONOMIC ANALYSIS OF THE INTERTEMPORAL ALLOCATION OF GROUNDWATER IN THE CENTRAL OGALLALA FORMATION,
W71-06266 04B

INTER-BASIN TRANSFERS
INTERBASIN DIVERSION OF WATER AN ANNOTATED BIBLIOGRAPHY,
W71-06071 07C

INTRACOASTAL WATERWAY
HOME REAL ESTATE LOAN AND INS CO V PARMELE (STATE MAY PASS TITLE TO NON-NAVIGABLE TIDAL WATERS).
W71-05980 06E

INVENTORY
ALLIANCE FOR ACTION,
W71-06448 05G

INVERTEBRATES
THE EFFECTS OF THE HERBICIDES DIQUAT AND DICHLOBENIL (CASORON) ON POND INVERTEBRATES PART I. ACUTE TOXICITY,
W71-06181 05C

INVESTIGATIONS
SUSQUEHANNA RIVER BASIN STUDY (SUMMARY),
W71-06227 06B

INFILTRATION IN SEWERS,
W71-06403 08A

INVESTMENT
A NOTE ON BIASES IN CAPITAL BUDGETING INTRODUCED BY INFLATION,
W71-05969 06C

INVESTMENT DECISION
COMPREHENSIVE ENVIRONMENTAL PLANNING,
W71-05950 06B

ION EXCHANGE
RECOVERY OF URANIUM FROM NATURAL MINE WATERS BY COUNTERCURRENT ION EXCHANGE,
W71-05841 05D

PHOSPHATE REMOVAL FORM TERTIARY EFFLUENT WITH ION EXCHANGE MATERIALS,
W71-05926 05D

RESEARCH ON PIEZODIALYSIS - SECOND REPORT,
W71-06236 03A

ION TRANSPORT
STUDY OF MASS TRANSFER IN MEMBRANE PROCESSES,
W71-06233 03A

IONS
ION-SELECTIVE ELECTROCHEMICAL SENSORS,
W71-06239 03A

ION-SELECTIVE ELECTROCHEMICAL SENSORS - SECOND REPORT,
W71-06240 03A

IOWA
BONE V MAY (RIPARIAN RIGHT TO ACCRETIONS WHERE FORMER RIPARIANS' LAND HAS ERODED).
W71-05952 06E

DASHNER V WOODS BROS CONST CO (IMPLEMENTATION OF RIVER PROTECTION PROJECT).
W71-06087 06E

AVAILABILITY OF GROUNDWATER IN DECATUR COUNTY, IOWA,
W71-06175 02F

IOWA STATE UNIVERSITY
YIELD REDUCTION BY CONTROLLED FLOODING OF CORN,
W71-06152 03F

IRON
CONDITIONS AFFECTING THE REDUCTION OF IRON AND MANGANESE BY BACTERIA IN THE ORE-BEARING LAKES OF THE KARELIAN ISTHMUS,
W71-05993 02K

MONTHLY VARIATION IN PHOSPHATE AND RELATED CHEMICALS FOUND IN THE SEDIMENT IN THE ISLAND AREA OF LAKE ERIE, 1967-68, WITH REFERENCE TO SAMPLES COLLECTED IN 1964, 1965, AND 1966,
W71-06187 05B

IRON ALLOYS
APPLICATION OF IRON-ALUMINUM BASE ALLOYS TO SALINE WATER CONVERSION,
W71-06235 08G

IRON OXIDES
TREATMENT OF ACID MINE DRAINAGE BY OZONE OXIDATION,
W71-06250 04D

IRON-ALUMINUM
APPLICATION OF IRON-ALUMINUM BASE ALLOYS TO SALINE WATER CONVERSION,
W71-06235 08G

IRRADIATION
RADIATION TREATMENT OF SEWAGE,
W71-06271 05D

IRRIGATION
A CRITICAL SURVEY OF USE OF COST-BENEFIT ANALYSIS IN PUBLIC FINANCE,
W71-05948 06C

PROBLEMS OF POLLUTION OF IRRIGATION WATERS IN ARID REGIONS,
W71-06112 05B

IRRIGATION DISTRICTS
INSTITUTIONAL FACTORS INFLUENCING WATER DEVELOPMENT IN TEXAS,
W71-05972 06B

IRRIGATION EFFECTS
EFFECTS OF IRRIGATION INTENSITY AND NITROGEN LEVEL ON THE PERFORMANCE OF EIGHT VARIETIES OF UPLAND COTTON, GOSSPYIUM HIRSUTUM L.,
W71-06068 03F

IRRIGATION EFFICIENCY
A COMPARISON OF WATER USE FOR HYBRID CORN IN THE BEKAA AND THE COASTAL PLAIN,
W71-06067 03F

EFFECTS OF IRRIGATION INTENSITY AND NITROGEN LEVEL ON THE PERFORMANCE OF EIGHT VARIETIES OF UPLAND COTTON, GOSSPYIUM HIRSUTUM L.,
W71-06068 03F

IRRIGATION INTERVALS
THE INFLUENCE OF VARIOUS SOIL MOISTURE-REGIMES ON THE YIELD AND QUALITY OF COTTON IN AN ARID ZONE,
W71-06217 03F

IRRIGATION PRACTICES
THE INFLUENCE OF VARIOUS SOIL MOISTURE-REGIMES ON THE YIELD AND QUALITY OF COTTON IN AN ARID ZONE,
W71-06217 03F

IRRIGATION SYSTEMS
A PROGRAMMING MODEL FOR FARM IRRIGATION SYSTEMS,
W71-05923 03F

IRRIGATION WATER
EFFECT OF FEEDLOT LAGOON WATER ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF SOILS,
W71-05974 05C

DEGRADATION OF WATER QUALITY IN IRRIGATION RETURN FLOWS,
W71-06063 03F

PROBLEMS OF POLLUTION OF IRRIGATION WATERS IN ARID REGIONS,
W71-06112 05B

ISLANDS
TALLASSEE POWER CO V CLARK (RIPARIAN RIGHTS IN RIVER BED AND IN FUTURE FLOOD WATERS AND ALLUVIAN).
W71-06305 06E

ISRAEL
ENVIRONMENTAL EFFECTS ON WOOD PRODUCTION AND CAMBIAL ACTIVITY IN ZIZIPHUS SPINACHRISTI (L.) WILLD.,
W71-06214 02I

JAMAICA BAY
JAMAICA BAY AND KENNEDY AIRPORT A MULTIDISCIPLINARY ENVIRONMENTAL STUDY.
W71-06045 06G

JOINTS(GEOLOGY)
THE ORIGIN OF THE LABYRINTH, WRIGHT VALLEY, ANTARCTICA,
W71-05847 02J

JUNIPER TREES
PINYON-JUNIPER CONTROL WHERE. WHY,
W71-06225 04D

KARELIAN ISTHMUS (SSR)
CONDITIONS AFFECTING THE REDUCTION OF IRON AND MANGANESE BY BACTERIA IN THE ORE-BEARING LAKES OF THE KARELIAN ISTHMUS,
W71-05993 02K

KASKASKIA RIVER(ILL)
PERIPHYTON ACCRUAL IN THE KASKASKIA RIVER AND ADJACENT FLOODPLAIN POOLS IN EAST-CENTRAL ILLINOIS,
W71-06011 02I

KENTUCKY
JONES V LOUISVILLE AND NASHVILLE RY (RECOVERY FOR FLOOD DAMAGE BY CONTRIBUTOR THERETO).
W71-06303 06E

KEWEENAW WATERWAY(MICH)
THE USE OF CONCENTRATIONS OF ELECTROLYTES AND NATURALLY FLUORESCENT MATERIALS TO STUDY WATER MASS MOVEMENTS IN A FRESHWATER 'ESTUARY',
W71-05877 02L

KINGFISHER(OKLA)
FLOOD PLAIN INFORMATION, KINGFISHER AND UNCLE JOHN'S CREEKS, KINGFISHER, OKLAHOMA.
W71-06119 04A

KINGS RIVER(CALIF)
THE DEVELOPMENT AND APPLICATION OF A HYDROLOGIC MODEL AS AN OPERATIONAL TOOL,
W71-06135 02C

KLANG-LANGAT DELTA(MALAYSIA)
SEDIMENTATION IN A MALAYSIAN HIGH TIDE TROPICAL DELTA,
W71-05858 02J

KOREA
SANITARY CONTROL OF SHELLFISH IN KOREA,
W71-06110 02L

LABORATORY TESTS
INVESTIGATIONS OF THE TECHNIQUES OF PURIFICATION OF ALGAL CULTURES ELABORATION OF METHODS APPLICABLE TO DESMIDS, FILAMENTOUS CYANOPHYTES, AND DIATOMS, (IN FRENCH),
W71-06002 07B

RADIAL WATER AND SOLUTE FLOWS IN ROOTS OF ZEA MAYS I. WATER FLOW,
W71-06064 02I

LABORATORY SIMULATION OF SNOWMELT,
W71-06139 02C

STUDIES ON THE CHEMICAL CONTROL OF TREE ROOTS IN SEWER LINES,
W71-06397 04A

LACTIC ACID
LACTIC AND PYRUVIC ACID CHANGES IN BLUEGILL SUNFISH (LEPOMIS MACROCHIRUS RAFINESQUE) DURING GRADUAL HYPOXIA AT TWO ACCLIMATION TEMPERATURES (5 AND 20C),
W71-06320 05C

LAKE ASHTABULA(ND)
PRIMARY PRODUCTION AND CHEMICAL AND PHYSICAL CHARACTERISTICS OF LAKE ASHTABULA RESERVOIR, NORTH DAKOTA,
W71-06008 02H

LAKE CHAMPLAIN(NY-VT)
LAKE CHAMPLAIN IN RELATION TO REGIONAL WATER SUPPLY,
W71-05875 03B

LAKE ERIE
TRACE ELEMENTS IN LAKE ERIE,
W71-05880 05A

SOME VARIATION IN THE QUALITY OF WATER FROM THE SOURCE AND MOUTH OF THE NIAGARA RIVER,
W71-05881 05A

WIND INDUCED CIRCULATION PATTERN IN A ROTATING MODEL OF LAKE ERIE,
W71-05891 02H

WAVE FORCES IN LAKE ERIE,
W71-05894 02H

MONTHLY VARIATION IN PHOSPHATE AND RELATED CHEMICALS FOUND IN THE SEDIMENT IN THE ISLAND AREA OF LAKE ERIE, 1967-68, WITH REFERENCE TO SAMPLES COLLECTED IN 1964, 1965, AND 1966,
W71-06187 05B

APPLIES EXISTING TECHNOLOGY FOR A CLEANER LAKE ERIE.
W71-06359 05G

STORM WATER TREATMENT AT CLEVELAND,
W71-06389 05D

LAKE HURON
SURFACE WATER INPUTS OF IODINE, BROMINE, AND CHLORINE TO LAKE HURON,
W71-05882 05B

LAKE LIVINGSTON
SELECTIVE WITHDRAWAL AT LAKE LIVINGSTON, PRELIMINARY EVALUATIONS, 1969,
W71-06193 05C

LAKE MICHIGAN
STATISTICAL ANALYSIS OF CURRENTS AT TWO NEAR-BY STATIONS IN LAKE MICHIGAN, SUMMER, 1967,
W71-05893 02H

VISUAL WAVE OBSERVATIONS ALONG THE LAKE MICHIGAN SHORE,
W71-05899 02H

DIURNAL CHANGES IN STRATIFICATION AND DISSOLVED OXYGEN IN THE SURFACE WATERS OF LAKE MICHIGAN,
W71-05900 02H

PLANKTON DIATOM ASSEMBLAGES IN LAKE MICHIGAN,
W71-05984 05C

A CASE STUDY OF COASTAL CURRENTS IN LAKE MICHIGAN,
W71-06174 02H

LAKE ONTARIO
REMOVAL OF CONTAMINANTS FROM LAKE ONTARIO BY NATURAL PROCESSES,
W71-05878 05G

INVESTIGATIONS OF DAILY VARIATIONS IN CHEMICAL BACTERIOLOGICAL AND BIOLOGICAL PARAMETERS AT TWO LAKE ONTARIO LOCATIONS NEAR TORONTO, PART I--CHEMISTRY,
W71-05879 05A

SOME VARIATION IN THE QUALITY OF WATER FROM THE SOURCE AND MOUTH OF THE NIAGARA RIVER,
W71-05881 05A

BOTTOM SEDIMENT SAMPLING,
W71-05886 07B

THE QUALITATIVE DISTRIBUTION OF FELDSPARS IN SURFICIAL BOTTOM SEDIMENTS FROM LAKE ONTARIO,
W71-05889 02J

LARGE-SCALE DIFFUSION STUDIES AT NIAGARA RIVER MOUTH, LAKE ONTARIO,
W71-05901 07B

JULY CURRENTS NEAR THE SOUTH SHORE OF LAKE ONTARIO,
W71-05978 02H

LAKE RESTORATION
REGENERATION OF THE SEVAN,
W71-06330 02H

LAKE SEVAN
REGENERATION OF THE SEVAN,
W71-06330 02H

LAKE SUPERIOR
THE USE OF CONCENTRATIONS OF ELECTROLYTES AND NATURALLY FLUORESCENT MATERIALS TO STUDY WATER MASS MOVEMENTS IN A FRESHWATER 'ESTUARY',
W71-05877 02L

SUMMER THERMAL STRUCTURE AND CIRCULATION OF CHEQUAMEGON BAY, LAKE SUPERIOR--A FLUCTUATING SYSTEM,
W71-05885 02H

FLOOD PLAIN INFORMATION, ONTONAGON RIVER, ONTONAGON, MICHIGAN, AND LAKE SUPERIOR SHORELINE, ONTONAGON COUNTY, MICHIGAN.
W71-06232 04A

LAKES
THE GENERATION OF LANGMUIR CIRCULATIONS BY THE EDDY PRESSURE OF SURFACE WAVES,
W71-05871 02H

LAKE CHAMPLAIN IN RELATION TO REGIONAL WATER SUPPLY,
W71-05875 03B

A FIELD STUDY OF LANGMUIR CIRCULATIONS,
W71-05884 02H

A STUDY OF FRESHWATER SAND GRAIN SURFACES BY SCANNING ELECT RON MICROSCOPY,
W71-05887 07B

GEOCHEMICAL SYSTEMS IN ONONDAGA LAKE (CENTRAL NEW YORK STATE) COMPARED WITH THE GREAT LAKES,
W71-05888 02H

GEOLOGICAL, CHEMICAL, AND PHYSICAL ATTRIBUTES OF SEDIMENTS IN SENECA LAKE, NEW YORK,
W71-05890 02J

INTERNAL WAVES OF THE SECOND VERTICAL MODE IN LAKE HURON,
W71-05896 02H

ON THE MECHANISM OF LANGMUIR CIRCULATIONS AND THEIR ROLE IN EPILIMNION MIXING,
W71-05975 02H

PRIMARY PRODUCTION AND CHEMICAL AND PHYSICAL CHARACTERISTICS OF LAKE ASHTABULA RESERVOIR, NORTH DAKOTA,
W71-06008 02H

EUTROPHICATION CAUSE--EFFECT RELATIONSHIPS,
W71-06009 05C

THE EFFECTS OF THERMAL DISCHARGES ON THE STRATIFICATION CYCLE OF LAKES,
W71-06082 05C

REGENERATION OF THE SEVAN,
W71-06330 02H

LAND MANAGEMENT
FRONTIERS IN CONSERVATION.
W71-06129 04C

LAND AND WATER MANAGEMENT FOR MINIMIZING SEDIMENT,
W71-06432 05G

LAND RECLAMATION
ULTIMATE DISPOSAL OF INDUSTRIAL WASTE AN OVERVIEW,
W71-06259 05E

LAND SUBSIDENCE
RECONNAISSANCE INVESTIGATION OF THE SUBSIDENCE OF VENICE AND SUGGESTED STEPS TOWARD ITS CONTROL,
W71-05870 02F

VENICE IS SINKING INTO THE SEA,
W71-06120 02F

LAND USE
GENESEE COUNTY ENVIRONMENTAL HEALTH, CONCLUSIONS REPORT, GENESEE COUNTY, MICHIGAN.
W71-05934 05B

WATERFRONT LAND USE IN THE AUSTRALIAN STATE CAPITALS,
W71-06065 06B

THE WOODSMAN'S ASSAULTS ON THE DOMAIN OF THE CATTLEMAN,
W71-06072 03F

LAND USE FUNCTION IN WATER QUALITY MANAGEMENT,
W71-06310 06B

LAND USE POLICY
LAND USE FUNCTION IN WATER QUALITY MANAGEMENT,
W71-06310 06B

LANDSLIDES
SUBAQUEOUS SLUMP STRUCTURES,
W71-05848 02J

LANGMUIR CIRCULATION
THE GENERATION OF LANGMUIR CIRCULATIONS BY THE EDDY PRESSURE OF SURFACE WAVES,
W71-05871 02H

A FIELD STUDY OF LANGMUIR CIRCULATIONS,
W71-05884 02H

ON THE MECHANISM OF LANGMUIR CIRCULATIONS AND THEIR ROLE IN EPILIMNION MIXING,
W71-05975 02H

LAOS
WATER RESOURCES DEVELOPMENT IN LAOS.
W71-05865 06B

LASER BEAM
LASER BEAM AND POWDER-ACTUATED TOOL SPEED PIPE LAYING.
W71-06354 08C

LC-50
EFFECTS OF ALKYL BENZENE SULFONATE ON RAINBOW TROUT,
W71-06325 05C

LEACHING
RECOVERY OF URANIUM FROM NATURAL MINE WATERS BY COUNTERCURRENT ION EXCHANGE,
W71-05841 05D

LEAD
TOXICITY OF ZINC, COPPER AND LEAD TO CHLOROPHYTA FROM FLOWING WATERS,
W71-05991 05C

LEAD MINING(MO)
POLLUTION FROM MINES IN THE 'NEW LEAD BELT' OF SOUTH EASTERN MISSOURI,
W71-05837 05A

LEAVES
EFFECT OF TIME OF EXPOSURE TO SALINITY ON GROWTH, WATER STATUS AND SALT ACCUMULATION IN BEAN PLANTS,
W71-06074 02I

LEBANON
A COMPARISON OF WATER USE FOR HYBRID CORN IN THE BEKAA AND THE COASTAL PLAIN,
W71-06067 03F

LEECHES
A POTENTIAL CONTROL FOR LEECHES,
W71-06322 05C

LEGAL ASPECTS
THE ENVIRONMENTAL LAWSUIT TRADITIONAL DOCTRINES AND EVOLVING THEORIES TO CONTROL POLLUTION,
W71-06048 05G

WATER-USE LAW AND ADMINISTRATION IN WISCONSIN,
W71-06192 06E

WATER, WATER EVERYWHERE---BUT A STUDY OF THE POLITICO-ADMINISTRATIVE ASPECTS OF WATER DEVELOPMENT IN MONTANA,
W71-06226 06E

LEGAL ASPECTS,
W71-06446 05G

LEGISLATION
WATER POLLUTION OBSERVATIONS ON CONNECTICUT'S RESPONSE,
W71-06047 05G

THE DISCHARGE OF STORM SEWAGE TO PUBLIC WATERS FROM AREAS OF GROUNDS WHICH ARE ENDANGERED BY OIL, IN CONNECTION WITH THE CLEAN WATER ACT FOR BERLIN,
W71-06388 05D

LEHMANN LOVEGRASS
THE SAN SIMON WATERSHED REVEGETATION,
W71-06223 04D

LETTUCE
SEED TABLETS FOR PRECISION PLANTING LETTUCE,
W71-06224 03F

LIFE CYCLES
EFFECTS ON PH ON THE LIFE CYCLE OF THE MIDGE TANYTARSUS DISSIMILIS,
W71-05982 05C

LIFE HISTORY STUDIES
SOME FACTORS INFLUENCING TOXICITY OF LINEAR ALKYLATE SULFONATE (LAS) TO THE BLUEGILL,
W71-06260 05C

LIGHT INTENSITY
REACTION RATES OF PHOTOSYNTHESIS,
W71-06039 05C

LIMNOLOGY
LIMNOLOGY OF ZUNI SALT LAKE, NEW MEXICO,
W71-05846 02H

COLORADO SEMIDRAINAGE MOUNTAIN LAKES,
W71-06165 02H

LINEAR ALKYLATE SULFONATE
SOME FACTORS INFLUENCING TOXICITY OF LINEAR ALKYLATE SULFONATE (LAS) TO THE BLUEGILL,
W71-06260 05C

LINEAR PROGRAMMING
A PROGRAMMING MODEL FOR FARM IRRIGATION SYSTEMS,
W71-05923 03F

LININGS
DRAINAGE AND TREATMENT.
W71-06351 05G

DEPTH OF FLOW AS DESIGN CRITERION FOR CHANNELS WITH ARTIFICIAL LINERS,
W71-06399 08B

LINT
EFFECTS OF IRRIGATION INTENSITY AND NITROGEN LEVEL ON THE PERFORMANCE OF EIGHT VARIETIES OF UPLAND COTTON, GOSSPYIUM HIRSUTUM L.,
W71-06068 03F

LINT QUALITY
THE INFLUENCE OF VARIOUS SOIL MOISTURE-REGIMES ON THE YIELD AND QUALITY OF COTTON IN AN ARID ZONE,
W71-06217 03F

LIPIDS
ON THE OCCURRENCE OF TRANS-3-HEXADECANOIC ACID IN CHLORELLA CELLS, (IN RUSSIAN),
W71-05989 02K

THE INFLUENCE OF ACCLIMATION TEMPERATURE ON THE LIPID COMPOSITION OF FISH GILL MITOCHONDRIA,
W71-06321 05C

LIQUID WASTE
LIQUID HANDLING OF POULTRY MANURE,
W71-06450 05D

LIVESTOCK
ANIMAL WASTE RUNOFF--A MAJOR WATER QUALITY CHALLENGE,
W71-06114 05B

LOADS(FORCES)
VARIATION OF GROUND SNOW LOADS IN BRITISH COLUMBIA,
W71-06140 02C

DEVELOPMENT OF SNOW LOAD DESIGN DATA FOR THE UNITED STATES,
W71-06141 02C

AN APPROACH TO SNOW LOAD EVALUATION,
W71-06142 02C

SNOW LOADS FOR THE DESIGN OF ROOFS IN CANADA,
W71-06143 08A

LOANS
SOIL AND WATER LOANS LAND CONSERVATION AND DEVELOPMENT LOANS.
W71-06283 06E

LONG ISLAND(NY)
WATER RESOURCES OF NASSAU AND SUFFOLK COUNTIES,
W71-05843 03D

LOS ANGELES
REPORT ON TRAPEZOIDAL FLUME MODEL.
W71-05929 08B

LOUISIANA
GIVENS V CHANDLER (INJUNCTION TO PROHIBIT INTERFERENCE WITH WATER SUPPLY).
W71-05976 06E

HOGUE V STRICKER LAND AND TIMBER CO (NAVIGABLE RIVER AS BOUNDARY BETWEEN STATES).
W71-06178 06E

BUILDING DRAINAGE PUMP STATIONS WITHIN LIMITED BUDGET,
W71-06378 08C

LOW WATER MARK
UNION SAND AND GRAVEL CO V NORTHCOTT (TITLE TO LAND BETWEEN HIGH AND LOW WATER MARKS).
W71-05979 06E

LOW-FLOW AUGMENTATION
POTENTIAL FOR STREAMFLOW AUGMENTATION BY GROUNDWATER PUMPING,
W71-06118 04B

LYSIMETERS
A COMPARISON OF WATER USE FOR HYBRID CORN IN THE BEKAA AND THE COASTAL PLAIN,
W71-06067 03F

WATER USE BY COTTON FROM LOW AND MODERATELY SALINE STATIC WATER TABLES,
W71-06221 03C

MAINTENANCE
THE SEWER HAD TO BE CLEANED BEFORE SNOWFALL,
W71-06396 05G

MALLARD DUCK
EFFECTS OF OIL POLLUTION ON WATERFOWL A STUDY OF SALVAGE METHODS,
W71-05983 05C

MANGANESE
CONDITIONS AFFECTING THE REDUCTION OF IRON AND MANGANESE BY BACTERIA IN THE ORE-BEARING LAKES OF THE KARELIAN ISTHMUS,
W71-05993 02K

MANHOLES
PORTABLE RECORDING OF SEWER FLOW.
W71-06390 08B

MANNINGS EQUATION
CANAL CAPACITY STUDIES MAIN CANAL COLUMBIA BASIN PROJECT,
W71-06109 04A

THE MECHANISM OF DIRECT RUNOFF FROM RAINFALL,
W71-06264 02G

MAPS
GROUNDWATER RECONNAISSANCE OF THE GREEN RIVER BASIN, SOUTHWESTERN WYOMING,
W71-05902 07C

WATER RELATED LAND USE IN THE BEAR RIVER DRAINAGE AREA,
W71-06212 07C

WATER RELATED LAND USE IN THE UTAH LAKE DRAINAGE AREA,
W71-06213 07C

HYDROLOGIC INVENTORY OF THE UTAH LAKE DRAINAGE AREA,
W71-06218 02E

HYDROLOGIC INVENTORY OF THE UINTAH STUDY UNIT,
W71-06219 02E

HYDROLOGIC INVENTORY OF THE WEBER RIVER STUDY UNIT,
W71-06220 02E

MARGINAL COSTS
MARGINAL COSTS OF ALTERNATIVE LEVELS OF WATER QUALITY IN THE UPPER MISSISSIPPI RIVER,
W71-06191 05G

MARINE ALGAE
STUDIES ON ULVA AND OTHER BENTHONIC MARINE ALGAE RECEIVING TREATED SEWAGE IN PONDS AND IN CALICO CREEK AT MOREHEAD CITY, NORTH CAROLINA,
W71-06021 02L

MARINE ANIMALS
INFLUENCE OF INDUSTRIAL EFFLUENTS ON ARTHROPODS OF THE MARINE SUPRALITTORAL ZONE, (IN GERMAN),
W71-06003 05C

FIRST YEAR RECORD OF TOTAL METABOLISM OF MARINE PONDS RECEIVING TREATED WASTES,
W71-06023 02L

MARINE BACTERIA
ANTIBACTERIAL SUBSTANCES PRODUCED BY MARINE BACTERIA (IN FRENCH),
W71-06203 05C

MARINE PONDS
FIRST YEAR RECORD OF TOTAL METABOLISM OF MARINE PONDS RECEIVING TREATED WASTES,
W71-06023 02L

MARKET FAILURE
THE ORGANIZATION OF ECONOMIC ACTIVITY ISSUES PERTINENT TO THE CHOICE OF MARKET VERSUS NONMARKET ALLOCATION,
W71-05966 06C

MARYLAND
TOLCHESTER BEACH IMPROVEMENT CO OF KENT COUNTY V BOYD (ABILITY OF PUBLIC TO ACQUIRE PRESCRIPTIVE ACCESS TO WATER).
W71-05998 06E

OYSTERS AND CLAMS (STATUTES GOVERNING TAKING OF OYSTERS AND CLAMS).
W71-06050 06E

AVAILABILITY OF GROUNDWATER IN CHARLES COUNTY, MARYLAND,
W71-06168 02F

COLGATE V PHILADELPHIA ELECTRIC POWER CO (CONSTITUTIONALITY OF CONDEMNATION OF PENNSYLVANIA LAND FOR OVERFLOW FROM MARYLAND DAM).
W71-06173 06E

THE MONOCACY RIVER-PHYSICAL, CHEMICAL AND BACTERIOLOGICAL WATER QUALITY REPORT NUMBER 1, MARCH-DECEMBER 1966,
W71-06176 05B

MASS TRANSFER
ESTIMATES OF MONTHLY EVAPORATION LOSSES FROM THE GREAT LAKES 1950 TO 1968 BASED ON THE MASS TRANSFER TECHNIQUE,
W71-05892 02D

AN INTERFEROMETRIC TECHNIQUE FOR TEMPERATURE AND CONCENTRATION MEASUREMENT FOR AN AIR-WATER INTERFACE,
W71-06090 05A

STUDY OF MASS TRANSFER IN MEMBRANE PROCESSES,
W71-06233 03A

MASSACHUSETTS
O'HEARN V TOWN OF ADAMS (DAMAGES FOR OVERFLOW OF SEWAGE).
W71-05967 06E

HOWES V TOWN OF BARNSTABLE (OWNERSHIP OF CLAM BEDS).
W71-06089 06E

MATERIAL RESIDUALS
ENVIRONMENTAL QUALITY MANAGEMENT,
W71-05941 06B

MATHEMATICAL MODELS
HORIZONTAL TRANSPORT IN A ROTATING BASIN OF PARABOLIC DEPTH PROFILE,
W71-05903 02E

PROCESS MODELING OF BIOLOGICAL WASTE TREATMENT,
W71-06026 05D

ONE-DIMENSIONAL OPEN CHANNEL HEAT DISPERSION,
W71-06085 05G

THE DEVELOPMENT AND APPLICATION OF A HYDROLOGIC MODEL AS AN OPERATIONAL TOOL,
W71-06135 02C

SIMULATING SNOWMELT HYDROGRAPHS FOR THE FRASER RIVER SYSTEM,
W71-06147 02A

OPERATIONS RESEARCH STUDY OF WATER RESOURCES - PART II,
W71-06307 06A

MATHEMATICAL STUDIES
A MODEL OF PUBLIC DECISIONS ILLUSTRATED BY A WATER POLLUTION POLICY PROBLEM,
W71-05939 06A

QUANTITATIVE ANALYSIS IN PUBLIC FINANCE,
W71-05947 06A

OVERFLOW STUDIES AT A SEWER SYSTEM OF A METROPOLITAN CITY,
W71-06373 08B

MAUI(HAWAII)
PRELIMINARY REPORT ON THE WATER RESOURCES OF THE WAILUKU AREA,
W71-06155 02E

MEAN RESIDENCE TIME
PROCESS MODELING OF BIOLOGICAL WASTE TREATMENT,
W71-06026 05D

MEASUREMENT
AN INTERFEROMETRIC TECHNIQUE FOR TEMPERATURE AND CONCENTRATION MEASUREMENT FOR AN AIR-WATER INTERFACE,
W71-06090 05A

OVERFLOW STUDIES AT A SEWER SYSTEM OF A METROPOLITAN CITY,
W71-06373 08B

DENSE NETWORK FOR RAPID MEASUREMENT OF RAINFALL RATE,

W71-06410 02B

OPTIMIZING WASTE TREATMENT CONTROL SYSTEMS,
W71-06414 05D

MECHANICAL CONTROL
PHYSICAL PROPERTIES AND PROCESSING CHARACTERISTICS OF MACROPHYTES AS RELATED TO MECHANICAL HARVESTING,
W71-06188 04A

MEMBRANE PROCESSES
STUDY OF MASS TRANSFER IN MEMBRANE PROCESSES,
W71-06233 03A

RESEARCH ON PIEZODIALYSIS - SECOND REPORT,
W71-06236 03A

BOUNDARY LAYER FLOW PROBLEMS IN DESALINATION BY REVERSE OSMOSIS,
W71-06237 03A

MEMBRANES
STUDY AND EXPERIMENTS IN WASTE WATER RECLAMATION BY REVERSE OSMOSIS,
W71-06025 05D

MERCURY
MERCURY USES IN CANADA AND THEIR POSSIBLE HAZARDS AS SOURCES OF MERCURY CONTAMINATION,
W71-05861 05B

HEAVY METAL POLLUTION POLICY AND PROGRAM IMPLICATIONS FOR THE PROTECTION OF THE ECOSYSTEM,
W71-06078 05A

ACTIVITIES OF THE FOOD AND AGRICULTURE ORGANIZATION AND THE WORLD HEALTH ORGANIZATION REGARDING MERCURY,
W71-06079 05A

EMBRYOTOXICITY OF MERCURY COMPOUNDS,
W71-06081 05C

MERCURY CONTAMINATION(CANADA)
MERCURY USES IN CANADA AND THEIR POSSIBLE HAZARDS AS SOURCES OF MERCURY CONTAMINATION,
W71-05861 05B

METABOLISM
FIRST YEAR RECORD OF TOTAL METABOLISM OF MARINE PONDS RECEIVING TREATED WASTES,
W71-06023 02L

METABOLISM OF QUINALDINE(2-METHYL-QUINOLINE). UPTAKE AND EXCRETION BY NURSE SHARKS,
W71-06324 05C

METALS
DISTRIBUTION OF TRACE METALS IN IMPOUNDMENTS,
W71-05971 05B

METEOROLOGICAL DATA
THE SURFACE INSTRUMENT NETWORK OF THE UPPER COLORADO RIVER PILOT PROJECT,
W71-06136 07A

METHANOL REQUIREMENT
METHANOL REQUIREMENT AND TEMPERATURE EFFECTS IN WASTE WATER DENITRIFICATION,
W71-06246 05D

METHODOLOGY
UNDERSTANDING SYSTEMS ENGINEERING,
W71-05918 06A

METHODS FOR CHEMICAL ANALYSIS OF FRESH WATERS.
W71-06159 02K

ANGLESEY ALUMINUM SEA OUTFALL,
W71-06289 08A

OPERATIONS RESEARCH STUDY OF WATER RESOURCES - PART II,
W71-06307 06A

MEASURING INTANGIBLE BENEFITS--SOME NEEDED RESEARCH,
W71-06313 06B

PUBLIC PARTICIPATION IN WATER PLANNING A CRITIQUE OF THEORY, DOCTRINE, AND PRACTICE,
W71-06315 06B

ECOLOGY AND SPATIAL ANALYSIS,
W71-06317 06F

VELOCITY MEASUREMENTS IN SEWERS VITAL TO DESIGN AND MAINTENANCE,
W71-06394 08B

METROPOLITAN WATER RESOURCES MANAGEMENT
A CRAZY IDEA ON URBAN WATER MANAGEMENT,
W71-06309 06B

MIAMI(FLA)
WATER QUALITY AT THE DADE-COLLIER TRAINING AND TRANSITION AIRPORT, MIAMI INTERNATIONAL AIRPORT, AND COTTONMOUTH CAMP-EVERGLADES NATIONAL PARK, FLORIDA, NOVEMBER, 1969,
W71-06158 05A

MICHIGAN
WATER RESOURCES OF THE BLACK RIVER BASIN, SOUTHEASTERN MICHIGAN,
W71-05869 07C

WATER POLLUTION PROBLEMS AND CONTROL PROGRAMS IN MICHIGAN'S PORTION OF THE GREAT LAKES.
W71-06053 05G

FLOOD PLAIN INFORMATION, ONTONAGON RIVER, ONTONAGON, MICHIGAN, AND LAKE SUPERIOR SHORELINE, ONTONAGON COUNTY, MICHIGAN.
W71-06232 04A

MICROBIOLOGY
BIOLOGICAL CONCEPTS AND INDUSTRIAL WASTE DISPOSAL PROBLEMS,
W71-06038 05D

MICROORGANISMS
FILAMENTOUS MICROORGANISMS AND THE BULKING OF ACTIVATED SLUDGE,
W71-06028 05D

BIOLOGICAL CONCEPTS AND INDUSTRIAL WASTE DISPOSAL PROBLEMS,
W71-06038 05D

STUDY OF THE INFLUENCE OF BDELLORIBRIO BACTERIOROUS IN MARINE SELF-PURIFICATION (IN FRENCH),
W71-06204 05C

ANTIBACTERIAL ACTIVITY OF A MARINE DIATOM ASTERIONELLA NOTATA (GRUN) (IN FRENCH),
W71-06211 05C

MIDDLE AMERICA TRENCH
SEDIMENTS OF THE NORTHERN MIDDLE AMERICA TRENCH,
W71-05844 02J

MIDGE
EFFECTS ON PH ON THE LIFE CYCLE OF THE MIDGE TANYTARSUS DISSIMILIS,
W71-05982 05C

MILLDAMS
STATE V MIDDLETOWN HYDRAULIC CO (VALIDITY OF WATER RIGHTS RESERVATION IN GRANT OF CANAL PROPERTY TO STATE).
W71-06098 06E

MILLET
THE ROLE OF SUCCULENT HALOPHYTES IN THE WATER BALANCE OF SALT MARSH RODENTS,
W71-06073 02I

MINE DRAINAGE
RECOVERY OF URANIUM FROM NATURAL MINE WATERS BY COUNTERCURRENT ION EXCHANGE,
W71-05841 05D

TREATMENT OF ACID MINE DRAINAGE BY OZONE OXIDATION,
W71-06250 04D

MINE WASTES
POLLUTION FROM MINES IN THE 'NEW LEAD BELT' OF SOUTH EASTERN MISSOURI,
W71-05837 05A

MINE WATER
RECOVERY OF URANIUM FROM NATURAL MINE WATERS BY COUNTERCURRENT ION EXCHANGE,
W71-05841 05D

MINERALOGY
THE QUALITATIVE DISTRIBUTION OF FELDSPARS IN SURFICIAL BOTTOM SEDIMENTS FROM LAKE ONTARIO,
W71-05889 02J

MINING
POLLUTION FROM MINES IN THE 'NEW LEAD BELT' OF SOUTH EASTERN MISSOURI,
W71-05837 05A

MINNEAPOLIS-ST
REMOTE-CONTROL 'MINI-DAMS' GUARD MINNEAPOLIS SEWERS.
W71-06345 08A

MINNESOTA
COUNTY OF BECKER V SHEVLIN LAND CO (RIGHT TO CONNECT NAVIGABLE STREAMS WITH HIGHWAYS).
W71-06099 06E

MINNOWS
A PRELIMINARY STUDY OF THE FEEDING RELATIONSHIPS OF FISH IN A HARD-WATER AND A SOFT-WATER STREAM IN SOUTHERN ENGLAND,
W71-06327 05C

MISSISSIPPI
HOGUE V STRICKER LAND AND TIMBER CO (NAVIGABLE RIVER AS BOUNDARY BETWEEN STATES).
W71-06178 06E

MISSISSIPPI RIVER
SOME FACTORS INFLUENCING TOXICITY OF LINEAR ALKYLATE SULFONATE (LAS) TO THE BLUEGILL,
W71-06260 05C

MISSOURI
POLLUTION FROM MINES IN THE 'NEW LEAD BELT' OF SOUTH EASTERN MISSOURI,
W71-05837 05A

GEOCHEMICAL SURVEY OF MISSOURI, PLANS AND PROGRESS FOR SECOND SIX-MONTH PERIOD (JANUARY-JUNE, 1970).
W71-05854 02K

GEOCHEMICAL SURVEY OF MISSOURI, PLANS AND PROGRESS FOR FIRST

SIX-MONTH PERIOD (JULY-DECEMBER, 1969).
W71-05874 02K

PUBLIC WATER FOR RURAL AREAS AND SMALL TOWNS,
W71-05973 06D

KELLY V CITY OF CAPE GIRARDEAU (LIABILITY OF CITY FOR FAILURE TO PROVIDE ADEQUATE STORM SEWERS).
W71-05997 06E

MIST
FIELD INVESTIGATION OF ENVIRONMENTAL EFFECTS OF COOLING TOWERS FOR LARGE STEAM ELECTRIC PLANTS,
W71-05930 05D

MIXING
THE GENERATION OF LANGMUIR CIRCULATIONS BY THE EDDY PRESSURE OF SURFACE WAVES,
W71-05871 02H

DIFFUSION FROM A CONTINUOUS SOURCE IN A UNIFORM SHEAR FLOW,
W71-05872 05B

LARGE-SCALE DIFFUSION STUDIES AT NIAGARA RIVER MOUTH, LAKE ONTARIO,
W71-05901 07B

ON THE MECHANISM OF LANGMUIR CIRCULATIONS AND THEIR ROLE IN EPILIMNION MIXING,
W71-05975 02H

TURBULENT DISPERSION IN POROUS MATERIALS AS MODELED BY A MIXING CELL WITH STAGNANT ZONE,
W71-06122 02F

MODEL STUDIES
WIND-DRIVEN CURRENTS IN A LONG ROTATING CHANNEL,
W71-05904 02E

REPORT ON TRAPEZOIDAL FLUME MODEL.
W71-05929 08B

A CRITICAL SURVEY OF USE OF COST-BENEFIT ANALYSIS IN PUBLIC FINANCE,
W71-05948 06C

OPTIMIZATION TECHNIQUES FOR WATER RESOURCE SYSTEMS,
W71-06062 06A

SIMULATION OF A WATER RESOURCE SYSTEM, FINAL REPORT,
W71-06066 05G

THERMAL DISCHARGE A MODEL - PROTOTYPE COMPARISON,
W71-06095 05B

LABORATORY SIMULATION OF SNOWMELT,
W71-06139 02C

WATER QUALITY MODELING AND PREDICTION,
W71-06186 05G

MODELING AND CONTROL OF THE POLLUTION OF WATER RESOURCES SYSTEMS VIA MULTILEVEL APPROACH,
W71-06311 06A

MODEL TESTS
THE INFLUENCE OF STRAINS IN SOIL MECHANICS,
W71-05907 08D

MODELS
AN ECONOMIC ANALYSIS OF THE INTERTEMPORAL ALLOCATION OF GROUNDWATER IN THE CENTRAL OGALLALA FORMATION,
W71-06266 04B

MOISTURE AVAILABILITY
ENVIRONMENTAL EFFECTS ON WOOD PRODUCTION AND CAMBIAL ACTIVITY IN ZIZIPHUS SPINACHRISTI (L.) WILLD.,
W71-06214 02I

MOISTURE CONTENT
MOISTURE TRANSPORT IN SLUDGE DEWATERING AND DRYING ON SAND BEDS,
W71-06031 05D

MOISTURE EXTRACTION
A COMPARISON OF WATER USE FOR HYBRID CORN IN THE BEKAA AND THE COASTAL PLAIN,
W71-06067 03F

MOISTURE STRESS
VARIATIONS IN WATER STRESS IN ONE-YEAR-OLD NEEDLES OF A PONDEROSA PINE,
W71-06057 02I

MOLE
TOOLS OF THE BUILDER.
W71-06335 08C

MOLLUSKS
MOLLUSCAN STUDIES,
W71-06015 02L

THE USE OF CARBON-14 FOR THE STUDY OF THE UPTAKE AND UTILIZATION OF PHYTOPLANKTON BY RANGEA CUNEATA,
W71-06019 02L

MONITORING
INVESTIGATIONS OF DAILY VARIATIONS IN CHEMICAL BACTERIOLOGICAL AND BIOLOGICAL PARAMETERS AT TWO LAKE ONTARIO LOCATIONS NEAR TORONTO, PART I--CHEMISTRY,
W71-05879 05A

PLANKTON REDUCTION IN THE REVERSED FLOW WATERWAYS OF THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO,
W71-05924 05B

EVALUATION OF AN AUTOMATIC CHEMICAL ANALYSIS MONITOR FOR WATER QUALITY PARAMETERS,
W71-06005 05A

A GENERAL REVIEW OF CONTINUOUS WATER QUALITY ANALYSIS INSTRUMENTATION,
W71-06295 05B

MONOCACY RIVER BASIN(MD)
THE MONOCACY RIVER-PHYSICAL, CHEMICAL AND BACTERIOLOGICAL WATER QUALITY REPORT NUMBER 1, MARCH-DECEMBER 1966,
W71-06176 05B

MONTANA
WATER, WATER EVERYWHERE---BUT .A STUDY OF THE POLITICO-ADMINISTRATIVE ASPECTS OF WATER DEVELOPMENT IN MONTANA,
W71-06226 06E

MOREHEAD CITY(NC)
STUDIES OF MARINE ESTUARINE ECOSYSTEMS DEVELOPING WITH TREATED SEWAGE WASTES,
W71-06012 02L

FUNGAL SURVEY IN WASTE PONDS AND CREEK,
W71-06013 02L

CHARACTERISTICS OF SPARTINA MARSH WHICH IS RECEIVING TREATED MUNICIPAL SEWAGE WASTES,
W71-06014 02L

MOLLUSCAN STUDIES,
W71-06015 02L

CRUSTACEANS AND FISHES IN THE SEA GRANT PONDS,
W71-06016 02L

CARBON,
W71-06017 02L

PHOSPHORUS FLUX BETWEEN WATER AND PLANKTON A PRELIMINARY REPORT,
W71-06018 02L

THE USE OF CARBON-14 FOR THE STUDY OF THE UPTAKE AND UTILIZATION OF PHYTOPLANKTON BY RANGEA CUNEATA,
W71-06019 02L

BENTHIC PRODUCTIVITY,
W71-06020 02L

STUDIES ON ULVA AND OTHER BENTHONIC MARINE ALGAE RECEIVING TREATED SEWAGE IN PONDS AND IN CALICO CREEK AT MOREHEAD CITY, NORTH CAROLINA,
W71-06021 02L

PHYTOPLANKTON POPULATIONS A PRELIMINARY REPORT,
W71-06022 02L

FIRST YEAR RECORD OF TOTAL METABOLISM OF MARINE PONDS RECEIVING TREATED WASTES,
W71-06023 02L

MUGIL CEPHALUS
'KEROSENE' TAINT IN SEA MULLET (MUGIL CEPHALUS LINNAEUS),
W71-06185 05C

MULLETS
'KEROSENE' TAINT IN SEA MULLET (MUGIL CEPHALUS LINNAEUS),
W71-06185 05C

MULTILEVEL OPTIMIZATION
MODELING AND CONTROL OF THE POLLUTION OF WATER RESOURCES SYSTEMS VIA MULTILEVEL APPROACH,
W71-06311 06A

MULTIPLE OBJECTIVES
PROJECT DESIGN AND EVALUATION WITH MULTIPLE OBJECTIVES,
W71-05962 06B

MULTIPLE-PURPOSE PROJECTS
STORM WATER TREATMENT AT CLEVELAND,
W71-06389 05D

MUNICIPAL WASTES
A STUDY OF MUNICIPAL WASTE WATER RECLAMATION,
W71-06041 05D

DESIGN CRITERIA FOR MUNICIPAL WASTE WATER TREATMENT PLANTS IN TENNESSEE,
W71-06043 05D

GOVERNMENTAL RESPONSIBILITY FOR WASTE MANAGEMENT IN URBAN REGIONS,
W71-06282 05G

CITY OF HARRISONVILLE V W S DICKEY CLAY MFG CO (ENJOINING CITY'S SEWAGE DISPOSAL INTO STREAM AS TEMPORARY NUISANCE).
W71-06304 06E

MUNICIPAL WATER
MCGEHEE V WILLIAMS (CONTRACT BETWEEN CITIES FOR PROVISION OF WATER).
W71-05836 06E

MASTER PLAN FOR THE DEVELOPMENT OF WATER DISTRIBUTION FACILITIES FOR GENESEE COUNTY, ENGINEERING REPORT.

W71-05933 08A

A STUDY OF MUNICIPAL WASTE WATER RECLAMATION,
W71-06041 05D

DESIGN CRITERIA FOR MUNICIPAL WASTE WATER TREATMENT PLANTS IN TENNESSEE,
W71-06043 05D

ECONOMICS OF COMBINING DISTILLED SEAWATER AND RENOVATED WASTE WATER AS A NEW SOURCE OF MUNICIPAL WATER SUPPLY,
W71-06238 03A

MUSSELS
MUSSELS (UNIONIDAE) OF THE RED RIVER VALLEY IN NORTH DAKOTA AND MINNESOTA, USA,
W71-06001 05C

NATIONAL DEVELOPMENT
THE BUREAU OF RECLAMATION'S ROLE IN AMERICA'S GROWTH,
W71-06308 06E

NATIONAL PARKS
SALINE ARTESIAN WATER AS A SUPPLEMENT,
W71-06124 03C

NATURAL RESOURCE ALLOCATION
THE ROLE OF INCENTIVES, PENALTIES, AND REWARDS IN ATTAINING EFFECTIVE POLICY,
W71-05959 06B

THE ORGANIZATION OF ECONOMIC ACTIVITY ISSUES PERTINENT TO THE CHOICE OF MARKET VERSUS NONMARKET ALLOCATION,
W71-05966 06C

NATURAL RESOURCES
ECONOMIC ANALYSIS IN NATURAL RESOURCE PROGRAMS,
W71-05940 06B

AN ECONOMIC ANALYSIS OF THE INTERTEMPORAL ALLOCATION OF GROUNDWATER IN THE CENTRAL OGALLALA FORMATION,
W71-06266 04B

NATURAL WATER POLLUTION
NATURAL POLLUTION IN ARID LAND WATERS,
W71-06113 05B

NAVIGABLE RIVERS
APPALACHIAN ELECTRIC POWER CO V SMITH (CONSTITUTIONALITY OF HYDROELECTRIC PROJECT LICENSING).
W71-05977 06E

COUNTY OF BECKER V SHEVLIN LAND CO (RIGHT TO CONNECT NAVIGABLE STREAMS WITH HIGHWAYS).
W71-06099 06E

NAVIGABLE WATERS
ASD SECURITIES V J H BELLOWS CO (RIGHT-OF-WAY OF NECESSITY WHEN ACCESS BY WATER BECOMES IMPOSSIBLE).
W71-05958 06E

NAVIGATION
NAVIGATION AND NAVIGABLE WATERS,
W71-06049 06E

OLIVER V CITY OF RICHMOND (COMPENSATION FOR STATE DIVERSION OF A NAVIGABLE STREAM).
W71-06162 06E

NEBRASKA
HOW TO SELECT AND APPLY ZINC FERTILIZER,
W71-06059 03F

A PROPOSED STREAMFLOW-DATA PROGRAM FOR NEBRASKA,
W71-06128 07A

NET MASS TRANSPORT
THE NET EXCHANGES OF PHOSPHORUS BY ESTUARINE SEDIMENTS IN FLOWING WATERS,
W71-06010 02J

NETHERLANDS
FREQUENCY OF STORM-SEWAGE OVERFLOWS. THE FREQUENCY OF STORM SEWAGE OVERFLOWS IN COMBINED SEWERAGE SYSTEMS IN CONNECTION WITH STORAGE AND PUMP CAPACITY, CONCLUSIONS FROM THE RAINFALL DATA OF THE KNMI FOR 1926-1962,
W71-06365 05G

NEUTRON ACTIVATION ANALYSIS
DEVELOPMENT OF NEUTRON ACTIVATION FOR INVESTIGATION OF WATER CLARIFICATION,
W71-06265 05D

NEVADA
WATER-RESOURCES APPRAISAL OF THE COLUMBUS SALT MARSH-SODA SPRING VALLEY AREA, MINERAL AND ESMERALDA COUNTIES, NEVADA,
W71-05862 04B

NEW JERSEY
A HYDROLOGIC ANALYSIS OF THE NEW JERSEY PINE BARRENS REGION,
W71-06125 02A

QUINLAN V BOROUGH OF FAIR HAVEN (TITLE DISPUTE TO RIPARIAN LAND AND SUBMERGED LAND UNDER DOCK).
W71-06145 06E

STATE OF NEW JERSEY V STATE OF DELAWARE (LOCATION OF DELAWARE RIVER BOUNDARY BETWEEN NEW JERSEY AND DELAWARE).
W71-06172 06E

STATISTICAL SUMMARIES OF NEW JERSEY STREAMFLOW RECORDS,
W71-06228 07C

NEW MEXICO
LIMNOLOGY OF ZUNI SALT LAKE, NEW MEXICO,
W71-05846 02H

NEW YORK
WATER RESOURCES OF NASSAU AND SUFFOLK COUNTIES,
W71-05843 03D

LAKE CHAMPLAIN IN RELATION TO REGIONAL WATER SUPPLY,
W71-05875 03B

A FIELD STUDY OF LANGMUIR CIRCULATIONS,
W71-05884 02H

JAMAICA BAY AND KENNEDY AIRPORT A MULTIDISCIPLINARY ENVIRONMENTAL STUDY.
W71-06045 06G

DIRECTORY OF PERSONNEL, WATER RESOURCES, WESTERN NEW YORK.
W71-06150 09A

GEORGE F FISH FARMS V STATE (STATE'S LIABILITY FOR FLOODING OF FARM).
W71-06163 06E

COLONNA V STATE (DAMAGES FOR FLOODING OF QUARRY).
W71-06164 06E

CRAGE V CITY OF BUFFALO (DUTY OF CITY TO PROVIDE FOR SEWAGE DISPOSAL).
W71-06170 06E

ALLEN V POTTER (RIGHT TO ERECT BOAT HOIST BELOW LOW WATER MARK).
W71-06280 06E

NEW YORK STATE BARGE CANAL
GEORGE F FISH FARMS V STATE (STATE'S LIABILITY FOR FLOODING OF FARM).
W71-06163 06E

NEW ZEALAND
THE MATTHES ROLLING DIAMETER AS AN INDICATOR OF CHANNEL STABILITY,
W71-06169 02J

NIAGARA RIVER
SOME VARIATION IN THE QUALITY OF WATER FROM THE SOURCE AND MOUTH OF THE NIAGARA RIVER,
W71-05881 05A

LARGE-SCALE DIFFUSION STUDIES AT NIAGARA RIVER MOUTH, LAKE ONTARIO,
W71-05901 07B

NIGER DELTA(AFRICA)
SEDIMENTS OF THE MODERN NIGER DELTA A SUMMARY AND REVIEW,
W71-05856 02J

NITRATES
SOURCES OF NITROGEN IN WATER SUPPLIES,
W71-06435 05B

CHEMISTRY OF NITROGEN IN SOILS,
W71-06436 05B

NITROGEN
EFFECTS OF IRRIGATION INTENSITY AND NITROGEN LEVEL ON THE PERFORMANCE OF EIGHT VARIETIES OF UPLAND COTTON, GOSSPYIUM HIRSUTUM L.,
W71-06068 03F

CHEMISTRY OF SEDIMENT IN WATER,
W71-06431 05B

SOURCES OF NITROGEN IN WATER SUPPLIES,
W71-06435 05B

CHEMISTRY OF NITROGEN IN SOILS,
W71-06436 05B

FERTILIZER MANAGEMENT FOR POLLUTION CONTROL,
W71-06437 05G

EFFECTS OF AGRICULTURAL POLLUTION ON EUTROPHICATION,
W71-06443 05C

NITROGEN AND AMINO ACIDS IN THE FECES OF YOUNG PIGS RECEIVING A PROTEIN-FREE DIET AND DIETS CONTAINING GRADED LEVELS OF SOYBEAN OIL MEAL OR CASEIN,
W71-06451 05B

NITROGEN COMPOUNDS
NITRATE POLLUTION OF WATER,
W71-06130 05B

NOISE
GRAND COULE THIRD POWERPLANT NOISE CONTROL STUDY,
W71-06329 08C

NOISE REDUCTION
GRAND COULE THIRD POWERPLANT NOISE CONTROL STUDY,
W71-06329 08C

NON-NAVIGABLE WATERS
APPALACHIAN ELECTRIC POWER CO V SMITH (CONSTITUTIONALITY OF HYDROELECTRIC PROJECT LICENSING).
W71-05977 06E

STATE V MOUNTS (BOUNDARIES ON NON-NAVIGABLE STREAMS WHERE SURVEY DIFFERS FROM NATURAL MONUMENTS).
W71-06007 06E

APPALACHIAN ELECTRIC POWER CO V SMITH (FEDERAL POWER COMMISSION'S POWER TO REGULATE PROJECTS ON NON-NAVIGABLE RIVERS).
W71-06183 06E

NORTH CAROLINA
SUMMARY OF DATA ON TEMPERATURE OF STREAMS IN NORTH CAROLINA, 1943-67,
W71-05855 07C

HOME REAL ESTATE LOAN AND INS CO V PARMELE (STATE MAY PASS TITLE TO NON-NAVIGABLE TIDAL WATERS).
W71-05980 06E

BLACK V TOWN OF BESSEMER CITY (DAMAGE TO LAND BY SEWAGE PLANT).
W71-06086 06E

NORTH CAROLINA WATER PLAN PROGRESS REPORT CHAPTER 6, RESEARCH (DRAFT).
W71-06116 06B

NORTH CAROLINA WATER PLAN
NORTH CAROLINA WATER PLAN PROGRESS REPORT CHAPTER 6, RESEARCH (DRAFT).
W71-06116 06B

NORTH DAKOTA
GROUNDWATER RESOURCES OF NELSON COUNTY, NORTHEASTERN NORTH DAKOTA,
W71-06160 07C

NUCLEAR EXPLOSIONS
GEOHYDROLOGY OF THE AREA NEAR WOSCO EXPLORATORY HOLE NUMBER 1, UINTAH COUNTY, UTAH,
W71-06153 08H

NUCLEAR FUEL REPROCESSING
LIQUID WASTE EFFLUENTS FROM A NUCLEAR FUEL REPROCESSING PLANT,
W71-06269 05B

NUCLEAR POWERPLANTS
FIELD INVESTIGATION OF ENVIRONMENTAL EFFECTS OF COOLING TOWERS FOR LARGE STEAM ELECTRIC PLANTS,
W71-05930 05D

CONTROL OF RELEASES OF RADIOACTIVITY TO THE ENVIRONMENT.
W71-06051 05G

NUCLEAR REACTORS
CONTROL OF RELEASES OF RADIOACTIVITY TO THE ENVIRONMENT.
W71-06051 05G

NUMERICAL ANALYSIS
COMPUTER METHODS FOR TRANSIENT ANALYSIS OF WATER-TABLE AQUIFERS,
W71-05920 02F

NUMERICAL INTEGRATION
PREDICTION OF MOISTURE MOVEMENT IN EXPANSIVE CLAYS,
W71-06272 02G

NUTRIENT REQUIREMENTS
THE ROLE OF SUCCULENT HALOPHYTES IN THE WATER BALANCE OF SALT MARSH RODENTS,
W71-06073 02I

NUTRIENTS
MARINE WASTE DISPOSAL AND SEA URCHIN ECOLOGY,
W71-06262 05C

SIGNIFICANCE OF PHOSPHORUS IN WATER SUPPLIES,
W71-06433 05B

OBJECTIVES
UNDERSTANDING SYSTEMS ENGINEERING,
W71-05918 06A

OCEAN DISPOSAL
ULTIMATE DISPOSAL OF INDUSTRIAL WASTE AN OVERVIEW,
W71-06259 05E

OCEANOGRAPHY
THE ECOLOGY AND OCEANOGRAPHY OF SEWER OUTFALLS,
W71-05928 06G

OCEANS
THE GENERATION OF LANGMUIR CIRCULATIONS BY THE EDDY PRESSURE OF SURFACE WAVES,
W71-05871 02H

OHIO
ASD SECURITIES V J H BELLOWS CO (RIGHT-OF-WAY OF NECESSITY WHEN ACCESS BY WATER BECOMES IMPOSSIBLE).
W71-05958 06E

THE CONSERVANCY DISTRICT LAW (OUTLINE AND TEXT OF OHIO CONSERVANCY DISTRICT LAW).
W71-06046 06E

STATE V MIDDLETOWN HYDRAULIC CO (VALIDITY OF WATER RIGHTS RESERVATION IN GRANT OF CANAL PROPERTY TO STATE).
W71-06098 06E

OIL POLLUTION
INFLUENCE OF INDUSTRIAL EFFLUENTS ON ARTHROPODS OF THE MARINE SUPRALITTORAL ZONE, (IN GERMAN),
W71-06003 05C

STUDY OF EQUIPMENT AND METHODS FOR REMOVING OR DISPERSING OIL FROM OPEN WATERS,
W71-06106 05G

OIL SEPARATORS
THE DISCHARGE OF STORM SEWAGE TO PUBLIC WATERS FROM AREAS OF GROUNDS WHICH ARE ENDANGERED BY OIL, IN CONNECTION WITH THE CLEAN WATER ACT FOR BERLIN,
W71-06388 05D

OIL SPILLS
A FEASIBILITY ANALYSIS OF INCINERATOR SYSTEMS FOR RESTORATION OF OIL CONTAMINATED BEACHES,
W71-06252 05E

OIL WASTES
EFFECTS OF OIL POLLUTION ON WATERFOWL A STUDY OF SALVAGE METHODS,
W71-05983 05C

THE OCCURRENCE OF POLYCYCLIC AROMATIC CARBOHYDRATES IN COASTAL WATERS AND ITS POSSIBLE EFFECTS ON MAN'S HEALTH (IN GERMAN),
W71-06207 05C

POLLUTION OF AMERICAN COASTS BY OIL (IN GERMAN),
W71-06208 05B

A FEASIBILITY ANALYSIS OF INCINERATOR SYSTEMS FOR RESTORATION OF OIL CONTAMINATED BEACHES,
W71-06252 05E

CHARACTERIZATION OF OIL SLICKS ON SURFACE WATERS,
W71-06261 05A

OIL WATER CALIFORNIA
EFFECTS OF OIL POLLUTION ON WATERFOWL A STUDY OF SALVAGE METHODS,
W71-05983 05C

OILS
A STUDY OF THE BEHAVIOR OF OIL SPILLS IN THE ARCTIC,
W71-06101 05B

STUDY OF EQUIPMENT AND METHODS FOR REMOVING OR DISPERSING OIL FROM OPEN WATERS,
W71-06106 05G

OILY WATER
CHARACTERIZATION OF OIL SLICKS ON SURFACE WATERS,
W71-06261 05A

OKLAHOMA
FLOOD PLAIN INFORMATION, KINGFISHER AND UNCLE JOHN'S CREEKS, KINGFISHER, OKLAHOMA.
W71-06119 04A

ONTONAGON COUNTY(MICH)
FLOOD PLAIN INFORMATION, ONTONAGON RIVER, ONTONAGON, MICHIGAN, AND LAKE SUPERIOR SHORELINE, ONTONAGON COUNTY, MICHIGAN.
W71-06232 04A

ON-SITE TESTS
A PORTABLE MULTIPARAMETER WATER QUALITY KIT,
W71-06157 05A

OPEN CHANNEL FLOW
ON UNIFORM FLOW THROUGH SMOOTH RECTANGULAR OPEN CHANNELS,
W71-05863 08B

OPERATIONS RESEARCH
OPERATIONS RESEARCH STUDY OF WATER RESOURCES - PART II,
W71-06307 06A

OPTIMIZATION
WATER RESOURCES SYSTEMS ANALYSIS OF DISCRETE DIFFERENTIAL DYNAMIC PROGRAMMING,
W71-05922 06A

A PROGRAMMING MODEL FOR FARM IRRIGATION SYSTEMS,
W71-05923 03F

EXTERNALITIES, INFORMATION AND ALTERNATIVE COLLECTIVE ACTION,
W71-05964 06B

SAFE YIELD OF AQUIFERS AN ECONOMIC REFORMULATION,
W71-06126 06B

ORDER
LIQUID HANDLING OF POULTRY MANURE,
W71-06450 05D

OREGON
THE DESCHUTES RIVER HYDROGRAPH FORECAST,
W71-06144 04A

ORGANIC ACIDS
ON THE OCCURRENCE OF TRANS-3-HEXADECANOIC ACID IN CHLORELLA CELLS, (IN RUSSIAN),
W71-05989 02K

ORIENTATION
FORMATION EVALUATION BY INSPECTION WITH THE BOREHOLE TELEVIEWER,
W71-05916 07B

ORTHOPHOSPHATE
BEHAVIOR OF SOIL AND FERTILIZER PHOSPHORUS IN RELATION TO WATER POLLUTION,
W71-06434 05B

OSCILLATORY FLUID FLOW
RESONANCE IN PRESSURIZED PIPING SYSTEMS,
W71-05905 08B

OSMOTIC FLOW
RADIAL WATER AND SOLUTE FLOWS IN ROOTS OF ZEA MAYS I. WATER FLOW,
W71-06064 02I

OUACHITA RIVER (ARK)
DISTRIBUTION OF TRACE METALS IN IMPOUNDMENTS,
W71-05971 05B

OUTLETS
THE ECOLOGY AND OCEANOGRAPHY OF SEWER OUTFALLS,
W71-05928 06G

ANGLESEY ALUMINUM SEA OUTFALL,
W71-06289 08A

THE WRAY FLOOD DISASTER AND ITS EFFECTS ON THE PUBLIC HEALTH SERVICES,
W71-06386 05F

OVERFLOW
O'HEARN V TOWN OF ADAMS (DAMAGES FOR OVERFLOW OF SEWAGE).
W71-05967 06E

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS (FIRST QUARTERLY ISSUE).
W71-06254 04C

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS (SECOND QUARTERLY ISSUE).
W71-06255 04C

CHARACTERIZATION AND CONTROL OF COMBINED SEWER OVERFLOWS, SAN FRANCISCO,
W71-06326 08B

MIDLAND DISTRICT CENTER.
W71-06331 05G

COMBINED SEWER SOLUTION SOUGHT IN SANDUSKY FIELD DEMONSTRATION.
W71-06352 05G

FREQUENCY OF STORM-SEWAGE OVERFLOWS. THE FREQUENCY OF STORM SEWAGE OVERFLOWS IN COMBINED SEWERAGE SYSTEMS IN CONNECTION WITH STORAGE AND PUMP CAPACITY, CONCLUSIONS FROM THE RAINFALL DATA OF THE KNMI FOR 1926-1962,
W71-06365 05G

WHITHER WATER POLLUTION CONTROL,
W71-06370 05G

WATER TREATMENT - A GUIDE TO THE TREATMENT OF WATER AND EFFLUENTS PURIFICATION CHAPTER 13 - INTRODUCTORY SEWER SYSTEMS--OVERFLOWS-CONSERVANCY,
W71-06371 05D

OVERFLOW STUDIES AT A SEWER SYSTEM OF A METROPOLITAN CITY,
W71-06373 08B

METHOD OF AND MEANS FOR DEALING WITH STORM-WATER OVERFLOWS IN SEWERS AND LIKE DRAINAGE SYSTEMS,
W71-06375 08B

A RE-EXAMINATION OF THE STORM TANK PROBLEM,
W71-06377 05D

STEPS TO SUCCESS IN WATER POLLUTION CONTROL,
W71-06379 05G

SOLVING A SEWER OVERFLOW PROBLEM,
W71-06387 08C

CLEANING OUR ENVIRONMENT-THE CHEMICAL BASIS FOR ACTION SECTION 2 - THE WATER ENVIRONMENT MUNICIPAL WASTE WATER TREATMENT.
W71-06415 05D

NEW IDEAS FOR CALCULATING STORM WATER OVERFLOW SETTINGS AND THE DESIGN OF STORM WATER TANKS.
W71-06416 08A

OVERLAND FLOW
THE MECHANISM OF DIRECT RUNOFF FROM RAINFALL,
W71-06264 02G

OWNERSHIP OF BEDS
UNION SAND AND GRAVEL CO V NORTHCOTT (TITLE TO LAND BETWEEN HIGH AND LOW WATER MARKS).
W71-05979 06E

HOWES V TOWN OF BARNSTABLE (OWNERSHIP OF CLAM BEDS).
W71-06089 06E

QUINLAN V BOROUGH OF FAIR HAVEN (TITLE DISPUTE TO RIPARIAN LAND AND SUBMERGED LAND UNDER DOCK).
W71-06145 06E

MILLER V COMMONWEALTH (TITLE TO VIRGINIA TIDAL MARSHES).
W71-06161 06E

STATE OF NEW JERSEY V STATE OF DELAWARE (LOCATION OF DELAWARE RIVER BOUNDARY BETWEEN NEW JERSEY AND DELAWARE).
W71-06172 06E

UNITED STATES V HAYES (TITLE TO STREAMBED FORMERLY PART OF INDIAN RESERVATION).
W71-06177 06E

OXIDATION LAGOONS
ECOLOGY OF SELECTED BACTERIA IN A SMALL INTERMITTENT SEWAGE POND,
W71-05995 05D

PORT ELGIN'S OXIDATION DITCH,
W71-06027 05D

EVALUATION OF SOME STABILIZATION PONDS IN INDIA,
W71-06033 05D

TREATMENT OF ORGANIC INDUSTRIAL WASTES BY LAGOONING,
W71-06036 05D

OXIDATION DITCH TREATMENT OF SWINE WASTES, SUMMARY REPORT,
W71-06442 05D

OXIDATION - REDUCTION POTENTIAL
EH AS AN OPERATIONAL PARAMETER IN ESTUARINE STUDIES,
W71-05873 02L

OXYGEN
FUNDAMENTAL ASPECTS OF SURFACE AERATOR PERFORMANCE AND DESIGN,
W71-06030 05D

OYSTERS
OYSTERS AND CLAMS (STATUTES GOVERNING TAKING OF OYSTERS AND CLAMS).
W71-06050 06E

SANITARY CONTROL OF SHELLFISH IN KOREA,
W71-06110 02L

OZONE
TREATMENT OF ACID MINE DRAINAGE BY OZONE OXIDATION,
W71-06250 04D

PAINESVILLE
SOLVING A SEWER OVERFLOW PROBLEM,
W71-06387 08C

PALEOCLIMATOLOGY
MULTIVARIATE TECHNIQUES FOR SPECIFYING TREE-GROWTH AND CLIMATE RELATIONSHIPS AND FOR RECONSTRUCTING ANOMALIES IN PALEOCLIMATE,
W71-05851 02B

PALO ALTO
SEWER IMPROVEMENTS CALL FOR TRUNK.
W71-06353 08F

PAMLICO RIVER ESTUARY(NC)
A STUDY OF RELATIONSHIPS BETWEEN ZOOPLANKTON ABUNDANCE AND SELECTED ENVIRONMENTAL VARIABLES IN THE PAMLICO RIVER ESTUARY OF EASTERN NORTH CAROLINA,
W71-05985 02I

PARAMETRIC HYDROLOGY
OVERFLOW STUDIES AT A SEWER SYSTEM OF A METROPOLITAN CITY,
W71-06373 08B

PARASITISM
STUDY OF THE INFLUENCE OF BDELLORIBRIO BACTERIOROUS IN MARINE SELF-PURIFICATION (IN FRENCH),
W71-06204 05C

PARETO OPTIMALITY
A MODEL OF PUBLIC DECISIONS ILLUSTRATED BY A WATER POLLUTION POLICY PROBLEM,
W71-05939 06A

EXTERNALITIES, INFORMATION AND ALTERNATIVE COLLECTIVE ACTION,
W71-05964 06B

PARTIAL DIFFERENTIAL EQUATIONS
PREDICTION OF MOISTURE MOVEMENT IN EXPANSIVE CLAYS,
W71-06272 02G

PASSIVE PRESSURE
EXPERIMENTAL AND THEORETICAL INVESTIGATIONS OF A PASSIVE EARTH PRESSURE PROBLEM,
W71-05919 08D

PASTURE MANAGEMENT
PLANTING CORN IN NATIVE SOD,
W71-06060 03F

PATH OF POLLUTANTS
WATER CHEMISTRY OF TOXAPHENE - ROLE OF LAKE SEDIMENTS,
W71-05840 05B

DIFFUSION FROM A CONTINUOUS SOURCE IN A UNIFORM SHEAR FLOW,
W71-05872 05B

EFFECT OF FEEDLOT LAGOON WATER ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF SOILS,
W71-05974 05C

THE FACTS BEHIND THE MERCURY,
W71-06100 05A

PATHOLOGY

THERMAL POLLUTION, AQUACULTURE AND PATHOBIOLOGY IN AQUATIC SYSTEMS,
W71-06092 05C

PEACH WASTES
WASTE REDUCTION IN FOOD CANNING OPERATIONS,
W71-06257 05D

PENNSYLVANIA
GROUNDWATER RESOURCES OF THE LOYSVILLE AND MIFFLINTOWN QUADRANGLES IN SOUTH-CENTRAL PENNSYLVANIA,
W71-05853 04B

COLGATE V PHILADELPHIA ELECTRIC POWER CO (CONSTITUTIONALITY OF CONDEMNATION OF PENNSYLVANIA LAND FOR OVERFLOW FROM MARYLAND DAM).
W71-06173 06E

PERCOLATING WATER
THE LAW OF WATER--INTRODUCTION WATERCOURSES PERCOLATING AND SURFACE WATERS.
W71-06281 06E

PERIPHYTON
PERIPHYTON ACCRUAL IN THE KASKASKIA RIVER AND ADJACENT FLOODPLAIN POOLS IN EAST-CENTRAL ILLINOIS,
W71-06011 02I

PERMAFROST
FORMATION OF THE THERMAL REGIME IN SOILS ON IRRIGATED FIELDS IN PERMAFROST REGIONS,
W71-06070 02G

PERSONNEL
DIRECTORY OF PERSONNEL, WATER RESOURCES, WESTERN NEW YORK.
W71-06150 09A

PERSONNEL DIRECTORY(WATER RESOURCES)
DIRECTORY OF PERSONNEL, WATER RESOURCES, WESTERN NEW YORK.
W71-06150 09A

PERSONNEL MANAGEMENT
WATER AND WASTE WATER WORKS OPERATIONS (CERTIFICATION OF WATER AND WASTE WATER OPERATIONS).
W71-06279 06E

PEST CONTROL
PESTICIDES AND PEST MANAGEMENT FOR MAXIMUM PRODUCTION AND MINIMUM POLLUTION,
W71-06441 05G

PEST MANAGEMENT
PESTICIDES AND PEST MANAGEMENT FOR MAXIMUM PRODUCTION AND MINIMUM POLLUTION,
W71-06441 05G

PESTICIDE DEGRADATION
INVESTIGATION OF MEANS FOR CONTROLLED SELF-DESTRUCTION OF PESTICIDES,
W71-06249 05G

PESTICIDE REMOVAL
INVESTIGATION OF MEANS FOR CONTROLLED SELF-DESTRUCTION OF PESTICIDES,
W71-06249 05G

PESTICIDE RESIDUES
PESTICIDE RESIDUES AND ENVIRONMENTAL ECONOMICS,
W71-05951 05G

PESTICIDES
WATER CHEMISTRY OF TOXAPHENE - ROLE OF LAKE SEDIMENTS,
W71-05840 05B

THE PESTICIDE BURDEN IN WATER AND ITS SIGNIFICANCE,
W71-06439 05B

PESTICIDES AND PEST MANAGEMENT FOR MAXIMUM PRODUCTION AND MINIMUM POLLUTION,
W71-06441 05G

PH CONTROL
WASTE REDUCTION IN FOOD CANNING OPERATIONS,
W71-06257 05D

PH TOXICITY
EFFECTS ON PH ON THE LIFE CYCLE OF THE MIDGE TANYTARSUS DISSIMILIS,
W71-05982 05C

PHENOLS
FOAM SEPARATION PROCESSES FROM INDUSTRIAL WASTE TREATMENT PHENOL, PHOSPHATE, AND HEXAVALENT CHROMIUM,
W71-06194 05D

PHOSPHATES
PHOSPHATE REMOVAL FORM TERTIARY EFFLUENT WITH ION EXCHANGE MATERIALS,
W71-05926 05D

PHOSPHOLIPIDS
THE INFLUENCE OF ACCLIMATION TEMPERATURE ON THE LIPID COMPOSITION OF FISH GILL MITOCHONDRIA,
W71-06321 05C

PHOSPHOROUS
MONTHLY VARIATION IN PHOSPHATE AND RELATED CHEMICALS FOUND IN THE SEDIMENT IN THE ISLAND AREA OF LAKE ERIE, 1967-68, WITH REFERENCE TO SAMPLES COLLECTED IN 1964, 1965, AND 1966,
W71-06187 05B

PHOSPHORUS
PHOSPHATE REMOVAL FORM TERTIARY EFFLUENT WITH ION EXCHANGE MATERIALS,
W71-05926 05D

THE WET EXCHANGES OF PHOSPHORUS BY ESTUARINE SEDIMENTS IN FLOWING WATERS,
W71-06010 02J

PHOSPHORUS FLUX BETWEEN WATER AND PLANKTON A PRELIMINARY REPORT,
W71-06018 02L

CHEMISTRY OF SEDIMENT IN WATER,
W71-06431 05B

SIGNIFICANCE OF PHOSPHORUS IN WATER SUPPLIES,
W71-06433 05B

BEHAVIOR OF SOIL AND FERTILIZER PHOSPHORUS IN RELATION TO WATER POLLUTION,
W71-06434 05B

FERTILIZER MANAGEMENT FOR POLLUTION CONTROL,
W71-06437 05G

EFFECTS OF AGRICULTURAL POLLUTION ON EUTROPHICATION,
W71-06443 05C

EFFECT OF SOIL TEMPERATURE ON THE AVAILABILITY OF PHOSPHORUS IN ANIMAL MANURES,
W71-06455 05C

PHOTOSYNTHESIS
FIRST YEAR RECORD OF TOTAL METABOLISM OF MARINE PONDS RECEIVING TREATED WASTES,
W71-06023 02L

REACTION RATES OF PHOTOSYNTHESIS,
W71-06039 05C

PHREATOPHYTES
WATER CONSERVATION BY REMOVAL OF PHREATOPHYTES,
W71-06154 03B

PHYSICAL PROPERTIES
PRIMARY PRODUCTION AND CHEMICAL AND PHYSICAL CHARACTERISTICS OF LAKE ASHTABULA RESERVOIR, NORTH DAKOTA,
W71-06008 02H

PHYSIOLOGICAL ECOLOGY
THE ROLE OF SUCCULENT HALOPHYTES IN THE WATER BALANCE OF SALT MARSH RODENTS,
W71-06073 02I

PHYTOPLANKTON
PLANKTON REDUCTION IN THE REVERSED FLOW WATERWAYS OF THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO,
W71-05924 05B

THE USE OF CARBON-14 FOR THE STUDY OF THE UPTAKE AND UTILIZATION OF PHYTOPLANKTON BY RANGEA CUNEATA,
W71-06019 02L

PHYTOPLANKTON POPULATIONS A PRELIMINARY REPORT,
W71-06022 02L

POLLUTION, BY BIOSYNTHESIS 'IN SITU' OF CARCINOGENOUS HYDROCARBONS, OF A LAGOON BIOCENOSIS 'IN VITRO' REPRODUCTION OF THIS PHENOMENON (IN FRENCH),
W71-06209 05B

PIEZODIALYSIS
RESEARCH ON PIEZODIALYSIS - SECOND REPORT,
W71-06236 03A

PINE BARRENS REGION(NJ)
A HYDROLOGIC ANALYSIS OF THE NEW JERSEY PINE BARRENS REGION,
W71-06125 02A

PINYON PINE TREES
PINYON-JUNIPER CONTROL WHERE. WHY,
W71-06225 04D

PIPE FLOW
ON UNIFORM FLOW THROUGH SMOOTH RECTANGULAR OPEN CHANNELS,
W71-05863 08B

PIPE MATERIALS
CALCAREOUS PIPE FOR SEWERS,
W71-06407 08F

PIPELINES
RESONANCE IN PRESSURIZED PIPING SYSTEMS,
W71-05905 08B

GIVENS V CHANDLER (INJUNCTION TO PROHIBIT INTERFERENCE WITH WATER SUPPLY).
W71-05976 06E

GLASS FIBER-REINFORCED PLASTICS PIPES FOR WATER PIPELINES,
W71-06291 08G

SEWER IMPROVEMENTS CALL FOR TRUNK.
W71-06353 08F

ALUMINUM PIPELINE FOR SEA OUTFALL SEWER.
W71-06355 08G

SUSPENDED SEWAGE PIPELINE.
W71-06356 08A

LONG-TIME DRAINAGE PROBLEM IS ELIMINATED,
W71-06405 08B

SOME THOUGHTS ON SEWER PIPE BEDDING,
W71-06412 08A

PIPES
SEWERS UNDER ATTACK,
W71-06301 08G

FLOOD CONTROL DESIGN UTILIZES LARGE ELLIPTICAL PIPE,
W71-06302 08A

PLASTIC FITTINGS SPEED LAYING OF SEWER PIPE.
W71-06338 08G

SEWERS UNDER ATTACK.
W71-06349 08G

STEEL PIPE SELECTED FOR STORM SEWER SYSTEM.
W71-06360 08G

CALCAREOUS PIPE FOR SEWERS,
W71-06407 08F

INSULATED CO-AXIAL PIPELINES,
W71-06408 08G

PIPING
DRAINAGE AND TREATMENT.
W71-06351 05G

PIPING SYSTEMS(MECHANICAL)
FIBERGLASS WINS PIPELINE,
W71-06300 08G

INSULATED CO-AXIAL PIPELINES,
W71-06408 08G

PLANE STRAIN
EXPERIMENTAL AND THEORETICAL INVESTIGATIONS OF A PASSIVE EARTH PRESSURE PROBLEM,
W71-05919 08D

PLANKTON
PLANKTON REDUCTION IN THE REVERSED FLOW WATERWAYS OF THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO,
W71-05924 05B

PLANKTON DIATOM ASSEMBLAGES IN LAKE MICHIGAN,
W71-05984 05C

OBSERVATIONS ON FLUCTUATIONS IN THE ABUNDANCE OF PLANKTON IN RELATION TO CERTAIN HYDROLOGICAL CONDITIONS OF RIVER GANGA,
W71-06004 02I

PHOSPHORUS FLUX BETWEEN WATER AND PLANKTON A PRELIMINARY REPORT,
W71-06018 02L

MARINE WASTE DISPOSAL AND SEA URCHIN ECOLOGY,
W71-06262 05C

PLANNING
SOCIO-CULTURAL IMPACTS OF WATER RESOURCE DEVELOPMENT IN THE SANTIAM RIVER BASIN,
W71-05921 06B

WATER RESOURCES SYSTEMS ANALYSIS OF DISCRETE DIFFERENTIAL DYNAMIC PROGRAMMING,
W71-05922 06A

MASTER PLAN FOR THE DEVELOPMENT OF WATER DISTRIBUTION FACILITIES FOR GENESEE COUNTY, ENGINEERING REPORT.
W71-05933 08A

REGIONAL PLANNING,
W71-05949 06B

RESCUING POLICY ANALYSIS FROM PPBS,
W71-05968 06B

INSTITUTIONAL FACTORS INFLUENCING WATER DEVELOPMENT IN TEXAS,
W71-05972 06B

NORTH CAROLINA WATER PLAN PROGRESS REPORT CHAPTER 6, RESEARCH (DRAFT).
W71-06116 06B

SUSQUEHANNA RIVER BASIN STUDY (SUMMARY),
W71-06227 06B

OPERATIONS RESEARCH STUDY OF WATER RESOURCES - PART II,
W71-06307 06A

WATER RESOURCES MANAGEMENT IN THE PUBLIC INTEREST,
W71-06314 06B

PUBLIC PARTICIPATION IN WATER PLANNING A CRITIQUE OF THEORY, DOCTRINE, AND PRACTICE,
W71-06315 06B

ECOLOGY AND SPATIAL ANALYSIS,
W71-06317 06F

SOLVING A SEWER OVERFLOW PROBLEM,
W71-06387 08C

PLANT GROUPINGS
ESTABLISHMENT OF PERENNIAL FORAGES I. SUBSEQUENT YIELDS II. SUBSEQUENT ROOT DEVELOPMENT,
W71-06215 03F

PLANT GROWTH
EFFECT OF TIME OF EXPOSURE TO SALINITY ON GROWTH, WATER STATUS AND SALT ACCUMULATION IN BEAN PLANTS,
W71-06074 02I

ENVIRONMENTAL EFFECTS ON WOOD PRODUCTION AND CAMBIAL ACTIVITY IN ZIZIPHUS SPINACHRISTI (L.) WILLD.,
W71-06214 02I

PLANT GROWTH REGULATORS
EFFECTS OF IRRIGATION INTENSITY AND NITROGEN LEVEL ON THE PERFORMANCE OF EIGHT VARIETIES OF UPLAND COTTON, GOSSPYIUM HIRSUTUM L.,
W71-06068 03F

FORMATION OF THE THERMAL REGIME IN SOILS ON IRRIGATED FIEL IN PERMAFROST REGIONS,
W71-06070 02G

EFFECT OF IRRIGATION ON RECOVERY OF APPLIED NITROGEN BY COTTON,
W71-06216 03F

THE INFLUENCE OF VARIOUS SOIL MOISTURE-REGIMES ON THE YIEL AND QUALITY OF COTTON IN AN ARID ZONE,
W71-06217 03F

PLANT NUTRIENTS
SIGNIFICANCE OF PHOSPHORUS IN WATER SUPPLIES,
W71-06433 05B

PLANT PHYSIOLOGY
PHYSIOLOGY OF BOLL SHEDDING IN COTTON IV. CORRELATION STUDIES ON FLOWER PRODUCTION AND BOLL SHEDDING IN RELATION TO TEMPERATURE AND RAINFALL,
W71-06056 03F

EFFECT OF TIME OF EXPOSURE TO SALINITY ON GROWTH, WATER STATUS AND SALT ACCUMULATION IN BEAN PLANTS,
W71-06074 02I

PLANT TISSUES
RADIAL WATER AND SOLUTE FLOWS IN ROOTS OF ZEA MAYS I. WATER FLOW,
W71-06064 02I

PLANTING
PLANTING CORN IN NATIVE SOD,
W71-06060 03F

SEED TABLETS FOR PRECISION PLANTING LETTUCE,
W71-06224 03F

PLASTIC PIPES
PLASTIC MAY BE PIPELINER'S BOON.
W71-06339 08G

INTERNATIONAL BUILDING EXHIBITION - OLYMPIA LONDON 13-25 NOVEMBER 1969.
W71-06348 08A

PLASTICS
PLASTICS IN WATER AND SEWAGE CONTROL,
W71-06286 08G

GLASS FIBER-REINFORCED PLASTICS PIPES FOR WATER PIPELINES,
W71-06291 08G

TANKS.
W71-06421 08G

PLASTICS IN WATER AND SEWAGE CONTROL,
W71-06424 08G

PLOTTERS
DISCUSSION OF THE USES OF ELECTRONIC PLOTTING IN GROUNDWATER ENGINEERING,
W71-05906 07C

PO RIVER DELTA(ITALY)
HYDROGRAPHY, SEDIMENT DISPERSAL, AND RECENT HISTORICAL DEVELOPMENT OF THE PO RIVER DELTA, ITALY,
W71-05859 02J

POINT SOURCES
LEGAL ASPECTS,
W71-06446 05G

POLICY ANALYSIS
RESCUING POLICY ANALYSIS FROM PPBS,
W71-05968 06B

POLITICAL ASPECTS
WATER, WATER EVERYWHERE---BUT A STUDY OF THE POLITICO-ADMINISTRATIVE ASPECTS OF WATER DEVELOPMENT IN MONTANA,
W71-06226 06E

POLITICAL DECISION PROCESS
A MODEL OF PUBLIC DECISIONS ILLUSTRATED BY A WATER POLLUTION POLICY PROBLEM,
W71-05939 06A

POLLUTANTS
POSSIBILITY OF STUDYING THE EFFECTS OF POLLUTION ON BENTHIC ORGANISMS EMPLOYING IMMERSED PANELS (IN FRENCH),
W71-06205 05C

EFFECTS OF AGRICULTURAL POLLUTANTS ON RECREATIONAL USES OF SURFACE WATERS,
W71-06444 05C

POLLUTION ABATEMENT
WATER POLLUTION OBSERVATIONS ON CONNECTICUT'S RESPONSE,
W71-06047 05G

THE ENVIRONMENTAL LAWSUIT TRADITIONAL DOCTRINES AND EVOLVING THEORIES TO CONTROL POLLUTION,
W71-06048 05G

VIEWS OF THE GOVERNORS ON TAX INCENTIVES AND EFFLUENT CHARGES (WATER POLLUTION CONTROL AND ABATEMENT).
W71-06052 05G

WATER QUALITY STANDARDS.
W71-06054 05G

THE ENFORCEMENT PHASE OF POLLUTION ABATEMENT THE ROLE OF THE ARMY ENGINEERS,
W71-06055 05G

IMPLICATIONS OF WATER QUALITY LAWS FOR THE FEEDLOT INDUSTRY,
W71-06222 05G

CITY OF HARRISONVILLE V W S DICKEY CLAY MFG CO (ENJOINING CITY'S SEWAGE DISPOSAL INTO STREAM AS TEMPORARY NUISANCE).
W71-06304 06E

ALTERNATIVES TO SEPARATION OF COMBINED SEWERS,
W71-06374 05D

STEPS TO SUCCESS IN WATER POLLUTION CONTROL,
W71-06379 05G

STORM WATER TREATMENT AT CLEVELAND,
W71-06389 05D

POLLUTION CONTROL
FERTILIZER MANAGEMENT FOR POLLUTION CONTROL,
W71-06437 05G

POLYESTER RESINS
PLASTICS IN WATER AND SEWAGE CONTROL,
W71-06424 08G

PONDEROSA PINE TREES
VARIATIONS IN WATER STRESS IN ONE-YEAR-OLD NEEDLES OF A PONDEROSA PINE,
W71-06057 02I

PONDS
TEMPERATURE CONTROL IN OUTDOOR EXPERIMENTAL PONDS,
W71-06093 05C

POPULATION BALANCE TECHNIQUES
PROCESS MODELING OF BIOLOGICAL WASTE TREATMENT,
W71-06026 05D

POPULATION EXPLOSION
THE LIFE OF MICROBES IN THE SEA AND THE CURRENT POLLUTION OUTLOOK (IN FRENCH),
W71-06202 05C

PORE PRESSURE
ENGINEERING BEHAVIOR AND STRUCTURE OF COMPACTED CLAY,
W71-05908 08D

POROUS MEDIA
TURBULENT DISPERSION IN POROUS MATERIALS AS MODELED BY A MIXING CELL WITH STAGNANT ZONE,
W71-06122 02F

PENETRATION IN A GRADED FILTER,
W71-06151 08B

PORTAGE INLET(CANADA)
EUTROPHICATION STUDIES OF A SHALLOW INLET ON VANCOUVER ISLAND,
W71-05988 02L

POTATOES
PRELIMINARY PROCESS DESIGN AND TREATABILITY STUDIES OF FISH PROCESSING WASTES,
W71-06035 05D

POTENTIAL EVAPOTRANSPIRATION
A COMPARISON OF WATER USE FOR HYBRID CORN IN THE BEKAA AND THE COASTAL PLAIN,
W71-06067 03F

POULTRY
AGRICULTURE WASTE RESEARCH NEEDS,
W71-06452 05D

POWER INTERCHANGE
TRANSMISSION IN THE 70'S,
W71-05912 08C

POWERPLANTS
THE EFFECTS OF THERMAL DISCHARGES ON THE STRATIFICATION CYCLE OF LAKES,
W71-06082 05C

PPBS
RESCUING POLICY ANALYSIS FROM PPBS,
W71-05968 06B

PRAIRIE SNOWPACKS
DENSITIES OF PRAIRIE SNOWPACKS,
W71-06137 02C

PRECIPITATION(ATMOSPHERIC)
OPPORTUNITIES FOR MODIFYING WEATHER TO AUGMENT PRECIPITATION AND SUPPRESS HAIL,
W71-06132 03B

PREFERENCES
THE FISCAL ECONOMIST AND QUANTITATIVE ANALYSIS,
W71-05956 06C

PRESCRIPTIVE RIGHTS
EDWARDS V ATCHISON, T AND S F RR (PRESCRIPTIVE RIGHT TO DISCHARGE WATER).
W71-05994 06E

TOLCHESTER BEACH IMPROVEMENT CO OF KENT COUNTY V BOYD (ABILITY OF PUBLIC TO ACQUIRE PRESCRIPTIVE ACCESS TO WATER).
W71-05998 06E

PRESSURE CONDUITS
STORM WATER TREATMENT AT CLEVELAND,
W71-06389 05D

TURBULENT FRICTION IN ECCENTRIC ANNULAR CONDUITS,
W71-06402 08B

PRIMARY PRODUCTIVITY
PRIMARY PRODUCTION AND CHEMICAL AND PHYSICAL CHARACTERISTICS OF LAKE ASHTABULA RESERVOIR, NORTH DAKOTA,
W71-06008 02H

PERIPHYTON ACCRUAL IN THE KASKASKIA RIVER AND ADJACENT FLOODPLAIN POOLS IN EAST-CENTRAL ILLINOIS,
W71-06011 02I

PRIVATE WATER RIGHTS
WATER-USE LAW AND ADMINISTRATION IN WISCONSIN,
W71-06192 06E

PROBLEM SHED
THE 'PROBLEM SHED' AS A UNIT FOR ENVIRONMENTAL CONTROL,
W71-05945 06B

PRODUCTIVITY
MEASURING EFFICIENCY IN GOVERNMENT SERVICES,
W71-05957 06B

BENTHIC PRODUCTIVITY,
W71-06020 02L

PROFESSIONAL PERSONNEL
DIRECTORY OF PERSONNEL, WATER RESOURCES, WESTERN NEW YORK.
W71-06150 09A

PROJECT FEASIBILITY
UNCERTAINTY AND ITS EFFECT ON CAPITAL INVESTMENT ANALYSIS,
W71-05954 06B

PROJECT PLANNING
COMPUTERS IN HONG KONG PUBLIC WORKS,
W71-06423 05G

PROTECTIVE COATINGS
IMPROVEMENT OF THE CORROSION RESISTANCE OF ALUMINUM BRASS FOR USE IN SEA WATER CONVERSION PLANTS,
W71-06234 08G

PROTEINS
NITROGEN AND AMINO ACIDS IN THE FECES OF YOUNG PIGS RECEIVING A PROTEIN-FREE DIET AND DIETS CONTAINING GRADED LEVELS OF SOYBEAN OIL MEAL OR CASEIN,
W71-06451 05B

PROTOTYPES
THERMAL DISCHARGE A MODEL - PROTOTYPE COMPARISON,
W71-06095 05B

PSEUDOMONAS
ANTIBACTERIAL SUBSTANCES PRODUCED BY MARINE BACTERIA (IN FRENCH),
W71-06203 05C

PSYCHOLOGICAL ASPECTS
SOCIO-CULTURAL IMPACTS OF WATER RESOURCE DEVELOPMENT IN THE SANTIAM RIVER BASIN,
W71-05921 06B

PUBLIC EXPENDITURE POLICY
THE ROLE OF INCENTIVES, PENALTIES, AND REWARDS IN ATTAINING EFFECTIVE POLICY,
W71-05959 06B

PUBLIC EXPENDITURES
ECONOMIC ANALYSIS IN NATURAL RESOURCE PROGRAMS,
W71-05940 06B

PROJECT DESIGN AND EVALUATION WITH MULTIPLE OBJECTIVES,
W71-05962 06B

PUBLIC FINANCE
QUANTITATIVE ANALYSIS IN PUBLIC FINANCE,
W71-05947 06A

PUBLIC HEALTH
HEAVY METAL POLLUTION POLICY AND PROGRAM IMPLICATIONS FOR THE PROTECTION OF THE ECOSYSTEM,
W71-06078 05A

WATER AND MAN'S HEALTH,
W71-06108 05F

PUBLIC INTEREST
WATER RESOURCES MANAGEMENT IN THE PUBLIC INTEREST,
W71-06314 06B

PUBLIC PARTICIPATION
PUBLIC PARTICIPATION IN WATER PLANNING A CRITIQUE OF THEORY, DOCTRINE, AND PRACTICE,
W71-06315 06B

PUBLIC PROGRAMS
THE ABSENCE OF KNOWLEDGE OF DISTRIBUTIONAL IMPACTS AN OBSTACLE TO EFFECTIVE POLICY ANALYSIS AND DECISIONS,
W71-05963 06B

PUBLIC RIGHTS
HOWES V TOWN OF BARNSTABLE (OWNERSHIP OF CLAM BEDS).
W71-06089 06E

PUBLIC UTILITIES
PUBLIC WATER FOR RURAL AREAS AND SMALL TOWNS,
W71-05973 06D

PULP AND PAPER INDUSTRY
AERIAL PHOTOGRAPHIC TRACING OF PULP MILL EFFLUENT IN MARINE WATERS,
W71-06258 05B

PUMPING PLANTS
BUILDING DRAINAGE PUMP STATIONS WITHIN LIMITED BUDGET,
W71-06378 08C

SOLVING A SEWER OVERFLOW PROBLEM,
W71-06387 08C

STORM WATER TREATMENT AT CLEVELAND,
W71-06389 05D

PURE ALGAL CULTURES
INVESTIGATIONS OF THE TECHNIQUES OF PURIFICATION OF ALGAL CULTURES ELABORATION OF METHODS APPLICABLE TO DESMIDS, FILAMENTOUS CYANOPHYTES, AND DIATOMS, (IN FRENCH),
W71-06002 07B

PYRUVIC ACID
LACTIC AND PYRUVIC ACID CHANGES IN BLUEGILL SUNFISH (LEPOMIS MACROCHIRUS RAFINESQUE) DURING GRADUAL HYPOXIA AT TWO ACCLIMATION TEMPERATURES (5 AND 20C),
W71-06320 05C

QUALITY ALTERATION
IMPLICATIONS OF WATER QUALITY LAWS FOR THE FEEDLOT INDUSTRY,
W71-06222 05G

QUALITY LEVELS
ECONOMIC ASPECTS,
W71-06447 05G

QUALITY PROBLEMS
QUANTITATIVE ANALYSIS IN PUBLIC FINANCE,
W71-05947 06A

QUANTITATIVE ANALYSIS
QUANTITATIVE ANALYSIS IN PUBLIC FINANCE,
W71-05947 06A

QUARRIES
COLONNA V STATE (DAMAGES FOR FLOODING OF QUARRY).
W71-06164 06E

QUINALDINE
METABOLISM OF QUINALDINE(2-METHYL-QUINOLINE). UPTAKE AND EXCRETION BY NURSE SHARKS,
W71-06324 05C

RADIATION
CHARACTERIZATION OF OIL SLICKS ON SURFACE WATERS,
W71-06261 05A

RADIOACTIVE CONTAMINANTS
LIQUID WASTE EFFLUENTS FROM A NUCLEAR FUEL REPROCESSING PLANT,
W71-06269 05B

RADIOACTIVE WASTE DISPOSAL
THE PRESENT STATE AND PROSPECTS OF DEVELOPMENT IN RADIOACTIVE WASTE MANAGEMENT IN THE USSR,
W71-06006 05E

RADIOACTIVE WASTES
CONTROL OF RELEASES OF RADIOACTIVITY TO THE ENVIRONMENT.
W71-06051 05G

RADIOCHEMICAL ANALYSIS
RADIOCHEMICAL ANALYSES OF WATER FROM SELECTED STREAMS, WELLS, SPRINGS, AND PRECIPITATION COLLECTED PRIOR TO REENTRY DRILLING, PROJECT RULISON,
W71-05842 05A

RAIN GAGES
INTERNATIONAL BUILDING EXHIBITION - OLYMPIA LONDON 13-25 NOVEMBER 1969.
W71-06348 08A

DENSE NETWORK FOR RAPID MEASUREMENT OF RAINFALL RATE,
W71-06410 02B

RAINBOW TROUT
EFFECTS OF ALKYL BENZENE SULFONATE ON RAINBOW TROUT,
W71-06325 05C

RAINFALL
OVERFLOW STUDIES AT A SEWER SYSTEM OF A METROPOLITAN CITY,
W71-06373 08B

RAINFALL ANALYSIS
PROBLEM OF FLOOD-CONTROL IN SMALL BASINS,
W71-06298 07C

RAINFALL DISPOSITION
DENSE NETWORK FOR RAPID MEASUREMENT OF RAINFALL RATE,
W71-06410 02B

RAINFALL-RUNOFF RELATIONSHIPS
SIMULATING SNOWMELT HYDROGRAPHS FOR THE FRASER RIVER SYSTEM
W71-06147 02A

RANGE GRASSES
THE SAN SIMON WATERSHED REVEGETATION,
W71-06223 04D

RANGEA CUNEATA
THE USE OF CARBON-14 FOR THE STUDY OF THE UPTAKE AND UTILIZATION OF PHYTOPLANKTON BY RANGEA CUNEATA,
W71-06019 02L

RANKINE LECTURES
THE INFLUENCE OF STRAINS IN SOIL MECHANICS,
W71-05907 08D

RATES OF APPLICATION
USE ANIMAL MANURE EFFECTIVELY,
W71-06454 05D

RECIRCULATION
WATER REQUIREMENTS FOR MANUFACTURING,
W71-06318 06D

RECREATION
EFFECTS OF AGRICULTURAL POLLUTANTS ON RECREATIONAL USES OF SURFACE WATERS,
W71-06444 05C

RECREATION DEMAND
THE DEMAND FOR LEISURE,
W71-05970 06D

RECYCLE
TREATMENT OF FISH HATCHERY EFFLUENT FOR RECYCLE,
W71-06024 05D

HYDRAULIC OVERLOADING-FACT OR FICTION,
W71-06198 05D

RECYCLING
LIQUID HANDLING OF POULTRY MANURE,
W71-06450 05D

RED RIVER(ND)
MUSSELS (UNIONIDAE) OF THE RED RIVER VALLEY IN NORTH DAKOTA AND MINNESOTA, USA,
W71-06001 05C

REDUCTION(CHEMICAL)
INVESTIGATION OF MEANS FOR CONTROLLED SELF-DESTRUCTION OF PESTICIDES,
W71-06249 05G

REFLECTION COEFFICIENTS
RADIAL WATER AND SOLUTE FLOWS IN ROOTS OF ZEA MAYS I. WATER FLOW,
W71-06064 02I

REFUSE DISPOSAL
SPECIAL STUDIES OF A SANITARY LANDFILL,
W71-06103 05B

REGIONAL ANALYSIS
GOVERNMENTAL RESPONSIBILITY FOR WASTE MANAGEMENT IN URBAN REGIONS,
W71-06282 05G

REGIONAL PLANNING
REGIONAL PLANNING,
W71-05949 06B

REGRESSION ANALYSIS
SNOW COURSE WEIGHTING PROCEDURE,
W71-06146 07C

REGULATED FLOW
NEW REGULATIONS AND CONSTRUCTIONS OF STORM-SEWAGE OVERFLOWS FOR THE RELIEF OF RECEIVING WATERS,
W71-06382 08B

REGULATION
NAVIGATION AND NAVIGABLE WATERS,
W71-06049 06E

RELATIVE HUMIDITY
A COMPARISON OF WATER USE FOR HYBRID CORN IN THE BEKAA AND THE COASTAL PLAIN,
W71-06067 03F

RELATIVE WATER CONTENT
EFFECT OF TIME OF EXPOSURE TO SALINITY ON GROWTH, WATER STATUS AND SALT ACCUMULATION IN BEAN PLANTS,
W71-06074 02I

REMEDIES
KELLY V CITY OF CAPE GIRARDEAU (LIABILITY OF CITY FOR FAILURE TO PROVIDE ADEQUATE STORM SEWERS).

W71-05997 06E

THE ENVIRONMENTAL LAWSUIT TRADITIONAL DOCTRINES AND EVOLVING THEORIES TO CONTROL POLLUTION, W71-06048 05G

JONES V LOUISVILLE AND NASHVILLE RY (RECOVERY FOR FLOOD DAMAGE BY CONTRIBUTOR THERETO). W71-06303 06E

REMOTE SENSING
HYDROLOGY OF LIMESTONE TERRANES, PHOTOGEOLOGIC INVESTIGATIONS, W71-05838 02F

SOME UNUSUAL SURFACE WATER TEMPERATURE PATTERNS IN THE GREAT LAKES, AS DETECTED BY AIRBORNE RADIATION THERMOMETER SURVEYS, W71-05898 07B

INFRARED PHOTOS CAN MAP SOILS, W71-06058 07B

WATER QUALITY TELEMETRY FINAL PROGRESS REPORT, W71-06069 05G

AERIAL PHOTOGRAPHIC TRACING OF PULP MILL EFFLUENT IN MARINE WATERS, W71-06258 05B

REPAIRING
WASHED-OUT PLATE CULVERT RESET IN 17-TON SECTIONS BY CRANE. W71-06336 08A

RESEARCH AND DEVELOPMENT
MEASURING INTANGIBLE BENEFITS--SOME NEEDED RESEARCH, W71-06313 06B

RESEARCH FACILITIES
NORTH CAROLINA WATER PLAN PROGRESS REPORT CHAPTER 6, RESEARCH (DRAFT). W71-06116 06B

RESEARCH OBJECTIVES
THE ECOLOGY AND OCEANOGRAPHY OF SEWER OUTFALLS, W71-05928 06G

RESEARCH PROGRAM PLANNING
THE ECOLOGY AND OCEANOGRAPHY OF SEWER OUTFALLS, W71-05928 06G

RESERVATION DOCTRINE
HOME REAL ESTATE LOAN AND INS CO V PARMELE (STATE MAY PASS TITLE TO NON-NAVIGABLE TIDAL WATERS). W71-05980 06E

RESERVOIR DESIGN
STREAMFLOW SYNTHESIS, W71-05946 04A

RESERVOIR DESTRATIFICATION
INDUCED HYPOLIMNION AERATION FOR WATER QUALITY IMPROVEMENT OF POWER RELEASES, W71-06251 05G

RESERVOIR OPERATION
SNOW AND RESERVOIR MANAGEMENT IN CANADA FOR THE COLUMBIA RIVER TREATY OPERATION, W71-06134 02C

RESERVOIR STORAGE
A BREAK FROM ACCEPTED PRACTICE . . . BRINGS STORM-WATER CONTROL WITHIN REACH OF OUR BOROUGH'S POCKETBOOK, W71-06384 05G

WATER STORAGE METHODS -- FROM CUPPED HANDS TO COMPUTERS, W71-06385 08A

RESONANCE
RESONANCE IN PRESSURIZED PIPING SYSTEMS, W71-05905 08B

RESORT AREA
PORT ELGIN'S OXIDATION DITCH, W71-06027 05D

RESOURCE ALLOCATION
MEASURING EFFICIENCY IN GOVERNMENT SERVICES, W71-05957 06B

COLLECTIVE ACTION AND THE DISTRIBUTION OF INCOME A CONCEPTUAL APPROACH, W71-05960 06C

INSTITUTIONAL OBSTACLES TO REALLOCATING GOVERNMENT EXPENDITURES, W71-05961 06B

RESOURCE DEVELOPMENT
THE FISCAL ECONOMIST AND QUANTITATIVE ANALYSIS, W71-05956 06C

RESOURCE GROWTH
THE FISCAL ECONOMIST AND QUANTITATIVE ANALYSIS, W71-05956 06C

RESPIRATION
EFFECTS OF ALKYL BENZENE SULFONATE ON RAINBOW TROUT, W71-06325 05C

RETAINING WALLS
EXPERIMENTAL AND THEORETICAL INVESTIGATIONS OF A PASSIVE EARTH PRESSURE PROBLEM, W71-05919 08D

RETURN FLOW
DEGRADATION OF WATER QUALITY IN IRRIGATION RETURN FLOWS, W71-06063 03F

RETURN(MONETARY)
USE ANIMAL MANURE EFFECTIVELY, W71-06454 05D

REVEGETATION
THE SAN SIMON WATERSHED REVEGETATION, W71-06223 04D

PINYON-JUNIPER CONTROL WHERE. WHY, W71-06225 04D

REVERSE OSMOSIS
STUDY AND EXPERIMENTS IN WASTE WATER RECLAMATION BY REVERSE OSMOSIS, W71-06025 05D

STUDY OF MASS TRANSFER IN MEMBRANE PROCESSES, W71-06233 03A

BOUNDARY LAYER FLOW PROBLEMS IN DESALINATION BY REVERSE OSMOSIS, W71-06237 03A

REVIEWS
DEVELOPMENT OF WATER RESOURCES IN ASIA AND THE FAR EAST-REPORT OF THE NINTH SESSION OF THE BIENNIAL REGIONAL CONFERENCE ON WATER RESOURCES DEVELOPMENT. W71-05864 06B

REVIEW OF SHEARING STRENGTH OF ROCKFILL, W71-05910 08D

THE ECOLOGY AND OCEANOGRAPHY OF SEWER OUTFALLS, W71-05928 06G

RHONE DELTA(FRANCE)
DEPOSITIONAL SEQUENCES AND SAND DISTRIBUTION IN THE POSTGLACIAL RHONE DELTA COMPLEX, W71-05857 02J

RIGHT-OF-WAY
UNITED STATES V BIG HORN LAND AND CATTLE CO (FORFEITURE OF RIGHT-OF-WAY ON PUBLIC LAND). W71-05911 06E

ASD SECURITIES V J H BELLOWS CO (RIGHT-OF-WAY OF NECESSITY WHEN ACCESS BY WATER BECOMES IMPOSSIBLE). W71-05958 06E

ALLEN V POTTER (RIGHT TO ERECT BOAT HOIST BELOW LOW WATER MARK). W71-06280 06E

RIPARIAN LAND
BONE V MAY (RIPARIAN RIGHT TO ACCRETIONS WHERE FORMER RIPARIANS' LAND HAS ERODED). W71-05952 06E

TOLCHESTER BEACH IMPROVEMENT CO OF KENT COUNTY V BOYD (ABILITY OF PUBLIC TO ACQUIRE PRESCRIPTIVE ACCESS TO WATER). W71-05998 06E

QUINLAN V BOROUGH OF FAIR HAVEN (TITLE DISPUTE TO RIPARIAN LAND AND SUBMERGED LAND UNDER DOCK). W71-06145 06E

GEORGE W ARMBRUSTER, JR, INC V WILDWOOD (EFFECT OF BEACH EROSION AND ACCRETION UPTON TITLE TO RIPARIAN LAND). W71-06195 06E

RIPARIAN RIGHTS
CONNECTICUT WATER LAW JUDICIAL ALLOCATION OF WATER RESOURCES, W71-06273 06E

ALLEN V POTTER (RIGHT TO ERECT BOAT HOIST BELOW LOW WATER MARK). W71-06280 06E

TALLASSEE POWER CO V CLARK (RIPARIAN RIGHTS IN RIVER BED AND IN FUTURE FLOOD WATERS AND ALLUVIAN). W71-06305 06E

RISK
THE TREATMENT OF RISK AND UNCERTAINTY, W71-05965 06B

RIVER BASIN COMMISSIONS
SUSQUEHANNA RIVER BASIN STUDY (SUMMARY), W71-06227 06B

RIVER BASIN DEVELOPMENT
SUSQUEHANNA RIVER BASIN STUDY (SUMMARY), W71-06227 06B

RIVER BEDS
TALLASSEE POWER CO V CLARK (RIPARIAN RIGHTS IN RIVER BED AND IN FUTURE FLOOD WATERS AND ALLUVIAN). W71-06305 06E

RIVER TRAINING
DASHNER V WOODS BROS CONST CO (IMPLEMENTATION OF RIVER PROTECTION PROJECT).

W71-06087 06E

RIVERS
REPORT ON BIOLOGICAL, CHEMICAL, AND GEOLOGICAL STUDIES OF BOIS BRULE AND POPLAR RIVER WATERSHEDS,
W71-05986 05C

PERIPHYTON ACCRUAL IN THE KASKASKIA RIVER AND ADJACENT FLOODPLAIN POOLS IN EAST-CENTRAL ILLINOIS,
W71-06011 02I

THE MONOCACY RIVER-PHYSICAL, CHEMICAL AND BACTERIOLOGICAL WATER QUALITY REPORT NUMBER 1, MARCH-DECEMBER 1966,
W71-06176 05B

ROADS
GEORGE W ARMBRUSTER, JR, INC V WILDWOOD (EFFECT OF BEACH EROSION AND ACCRETION UPTON TITLE TO RIPARIAN LAND).
W71-06195 06E

ROCK EXCAVATION
MODIFIED TRENCHER SLICES THROUGH FLINT-HARD ROCK,
W71-06411 08E

ROCK FILLS
REVIEW OF SHEARING STRENGTH OF ROCKFILL,
W71-05910 08D

ROCK SLOPE STABILITY
STABILITY OF ROCK SLOPES--GRAPHICAL METHODS,
W71-05909 02E

ROCKS
STABILITY OF ROCK SLOPES--GRAPHICAL METHODS,
W71-05909 02E

RODENTS
THE ROLE OF SUCCULENT HALOPHYTES IN THE WATER BALANCE OF SALT MARSH RODENTS,
W71-06073 02I

ROOFTOP STORAGE
A CRAZY IDEA ON URBAN WATER MANAGEMENT,
W71-06309 06B

ROOT DEVELOPMENT
ESTABLISHMENT OF PERENNIAL FORAGES I. SUBSEQUENT YIELDS II. SUBSEQUENT ROOT DEVELOPMENT,
W71-06215 03F

ROOT SYSTEMS
RADIAL WATER AND SOLUTE FLOWS IN ROOTS OF ZEA MAYS I. WATER FLOW,
W71-06064 02I

STUDIES ON THE CHEMICAL CONTROL OF TREE ROOTS IN SEWER LINES,
W71-06397 04A

ROTATIONAL FLOW
HORIZONTAL TRANSPORT IN A ROTATING BASIN OF PARABOLIC DEPTH PROFILE,
W71-05903 02E

ROUGHNESS COEFFICIENT
CANAL CAPACITY STUDIES MAIN CANAL COLUMBIA BASIN PROJECT,
W71-06109 04A

RUBBER
WATER POLLUTION CONTROL. 5 BILLION DOLLARS TAB,
W71-06297 05G

STORAGE BLADDERS FOR SEWAGE.
W71-06344 05G

RUBBER STORAGE CONTAINERS
WATER POLLUTION CONTROL. 5 BILLION DOLLARS TAB,
W71-06297 05G

IT'S IN THE BAG.
W71-06332 05G

STORMWATER OVERFLOW GETS BAGGED.
W71-06341 05G

STORAGE BLADDERS FOR SEWAGE.
W71-06344 05G

STORM WATER STORAGE SCHEME.
W71-06357 05G

UNDERWATER SEWAGE STORAGE AN AID TO POLLUTION ABATEMENT.
W71-06361 05G

RUNOFF
SIMULATION OF RUNOFF FROM URBAN WATERSHEDS,
W71-06306 04C

RUNOFF FORECASTING
THE DEVELOPMENT AND APPLICATION OF A HYDROLOGIC MODEL AS AN OPERATIONAL TOOL,
W71-06135 02C

USING ALL AVAILABLE HYDROLOGIC DATA,
W71-06138 07C

SNOW SURVEY TELEMETRY NETWORKS AND FUTURE PLANS,
W71-06148 07A

RUNOFF SYNTHESIS
SIMULATING SNOWMELT HYDROGRAPHS FOR THE FRASER RIVER SYSTEM,
W71-06147 02A

RUNOFF TREATMENT
SCREEN TREATMENT FOR SEWER OVERFLOWS.
W71-06333 05D

RURAL AREAS
PUBLIC WATER FOR RURAL AREAS AND SMALL TOWNS,
W71-05973 06D

RURAL WATER DISTRICTS--HERE IS WHY THEY ARE NEEDED,
W71-06061 06B

SOIL AND WATER LOANS LAND CONSERVATION AND DEVELOPMENT LOANS.
W71-06283 06E

GRANTS FOR PREPARATION OF COMPREHENSIVE AREA PLANS FOR WATT AND SEWER SYSTEMS.
W71-06284 06A

RURAL WATER DISTRICTS
RURAL WATER DISTRICTS--HERE IS WHY THEY ARE NEEDED,
W71-06061 06B

SAFE YIELD
SAFE YIELD OF AQUIFERS AN ECONOMIC REFORMULATION,
W71-06126 06B

SALINE LAKES
LIMNOLOGY OF ZUNI SALT LAKE, NEW MEXICO,
W71-05846 02H

SALINE WATER
LIMNOLOGY OF ZUNI SALT LAKE, NEW MEXICO,
W71-05846 02H

CRUSTACEANS AND FISHES IN THE SEA GRANT PONDS,
W71-06016 02L

FIRST YEAR RECORD OF TOTAL METABOLISM OF MARINE PONDS RECEIVING TREATED WASTES,
W71-06023 02L

SALINE ARTESIAN WATER AS A SUPPLEMENT,
W71-06124 03C

WATER USE BY COTTON FROM LOW AND MODERATELY SALINE STATIC WATER TABLES,
W71-06221 03C

SALINITY
EFFECT OF TIME OF EXPOSURE TO SALINITY ON GROWTH, WATER STATUS AND SALT ACCUMULATION IN BEAN PLANTS,
W71-06070 02I

SOME ASPECTS OF BIOLOGY OF CARCINUS MAENAS (L) II SURVIVA AT LOW SALINITY,
W71-06179 05C

SALMON
A PRELIMINARY STUDY OF THE FEEDING RELATIONSHIPS OF FISH IN A HARD-WATER AND A SOFT-WATER STREAM IN SOUTHERN ENGLAND,
W71-06327 05C

SALT MARSHES
CHARACTERISTICS OF SPARTINA MARSH WHICH IS RECEIVING TREATE MUNICIPAL SEWAGE WASTES,
W71-06014 02L

THE ROLE OF SUCCULENT HALOPHYTES IN THE WATER BALANCE OF SALT MARSH RODENTS,
W71-06073 02I

SALT WATER IRRIGATION
DEGRADATION OF WATER QUALITY IN IRRIGATION RETURN FLOWS,
W71-06063 03F

SALTS
THE ORIGIN OF THE LABYRINTH, WRIGHT VALLEY, ANTARCTICA,
W71-05847 02J

SOME EFFECTS OF HIGH SALT CONCENTRATIONS ON ACTIVATED SLUDGE,
W71-06034 05D

SAMPLING
BOTTOM SEDIMENT SAMPLING,
W71-05886 07B

SAN FRANCISCO
FIBERGLASS WINS PIPELINE,
W71-06300 08G

CHARACTERIZATION AND CONTROL OF COMBINED SEWER OVERFLOWS, SAN FRANCISCO,
W71-06326 08B

SAN SIMON WATERSHED(ARIZONA)
THE SAN SIMON WATERSHED REVEGETATION,
W71-06223 04D

SAND BEDS
MOISTURE TRANSPORT IN SLUDGE DEWATERING AND DRYING ON SAND BEDS,
W71-06031 05D

SAND DUNES
DEFORMATION OF LEE-SIDE LAMINAE IN EOLIAN DUNES,
W71-05845 02J

SANDS
DEFORMATION OF LEE-SIDE LAMINAE IN EOLIAN DUNES,
W71-05845 02J

A STUDY OF FRESHWATER SAND GRAIN SURFACES BY SCANNING ELECT RON MICROSCOPY,
W71-05887 07B

SANDUSKY
STORM WATER STORAGE SCHEME.
W71-06357 05G

SANITARY ENGINEERING
SPECIAL STUDIES OF A SANITARY LANDFILL,
W71-06103 05B

SANITARY LANDFILLS
SPECIAL STUDIES OF A SANITARY LANDFILL,
W71-06103 05B

SANITARY SEWERS
SEWERS UNDER ATTACK,
W71-06301 08G

SANTIAM RIVER BASIN
SOCIO-CULTURAL IMPACTS OF WATER RESOURCE DEVELOPMENT IN THE SANTIAM RIVER BASIN,
W71-05921 06B

SATURATED REGION
SEEPAGE FACE EFFECTS IN UNSTEADY GROUNDWATER FLOW,
W71-06190 02F

SATURATED SOILS
UREA CONVERSION TO AMMONIA IN WATERLOGGED SOILS,
W71-05866 02K

SCOTLAND
MAIN DRAINAGE,
W71-06422 08A

SCRAPER
SCAPER PRODUCTION SPEEDS PIPE TRENCHING AT LOWER COSTS,
W71-06287 08C

SCREENS
WASTE REDUCTION IN FOOD CANNING OPERATIONS,
W71-06257 05D

SCREEN TREATMENT FOR SEWER OVERFLOWS.
W71-06333 05D

SEA URCHINS
MARINE WASTE DISPOSAL AND SEA URCHIN ECOLOGY,
W71-06262 05C

SEA WATER
EH AS AN OPERATIONAL PARAMETER IN ESTUARINE STUDIES,
W71-05873 02L

INFLUENCE OF INDUSTRIAL EFFLUENTS ON ARTHROPODS OF THE MARINE SUPRALITTORAL ZONE, (IN GERMAN),
W71-06003 05C

DEVELOPMENT OF AN INSTRUMENT FOR MEASURING THE CONCENTRATION OF DISSOLVED OXYGEN IN SEA WATER IN SITU,
W71-06104 05A

SODIUM, MAGNESIUM, AND CALCIUM SULFATE ION-PAIRS IN SEAWATER AT 25C,
W71-06166 02K

EFFECT OF TEMPERATURE ON THE PH OF SEAWATER,
W71-06167 02K

SEAFOOD
SANITARY CONTROL OF SHELLFISH IN KOREA,
W71-06110 02L

SEALANTS
CARBONATE BONDING OF COAL REFUSE,
W71-06256 05G

SEASHORES
THE LIFE OF MICROBES IN THE SEA AND THE CURRENT POLLUTION OUTLOOK (IN FRENCH),
W71-06202 05C

SEATTLE
STEPS TO SUCCESS IN WATER POLLUTION CONTROL,
W71-06379 05G

SEDIMENT ANALYSIS
MONTHLY VARIATION IN PHOSPHATE AND RELATED CHEMICALS FOUND IN THE SEDIMENT IN THE ISLAND AREA OF LAKE ERIE, 1967-68, WITH REFERENCE TO SAMPLES COLLECTED IN 1964, 1965, AND 1966,
W71-06187 05B

SEDIMENT CONTROL
THE UPLAND FOREST VEGETATION OF THE BOIS BRULE RIVER BASIN, TRIBUTARY TO LAKE SUPERIOR,
W71-05987 02J

SEDIMENT TRANSPORT
HYDRODYNAMIC EFFECTS OF SEEPAGE ON BED PARTICLES,
W71-05839 02J

SEDIMENTS OF THE NORTHERN MIDDLE AMERICA TRENCH,
W71-05844 02J

GEOLOGICAL, CHEMICAL, AND PHYSICAL ATTRIBUTES OF SEDIMENTS IN SENECA LAKE, NEW YORK,
W71-05890 02J

THE MATTHES ROLLING DIAMETER AS AN INDICATOR OF CHANNEL STABILITY,
W71-06169 02J

POLLUTION BY SEDIMENT SOURCES AND THE DETACHMENT AND TRANSPORT PROCESSES,
W71-06430 05B

SEDIMENTARY STRUCTURES
DEFORMATION OF LEE-SIDE LAMINAE IN EOLIAN DUNES,
W71-05845 02J

SUBAQUEOUS SLUMP STRUCTURES,
W71-05848 02J

SEDIMENTS OF THE MODERN NIGER DELTA A SUMMARY AND REVIEW,
W71-05856 02J

DEPOSITIONAL SEQUENCES AND SAND DISTRIBUTION IN THE POSTGLACIAL RHONE DELTA COMPLEX,
W71-05857 02J

SEDIMENTATION IN A MALAYSIAN HIGH TIDE TROPICAL DELTA,
W71-05858 02J

HYDROGRAPHY, SEDIMENT DISPERSAL, AND RECENT HISTORICAL DEVELOPMENT OF THE PO RIVER DELTA, ITALY,
W71-05859 02J

FACIES AND DEVELOPMENT OF THE COLORADO RIVER DELTA IN TEXAS,
W71-05860 02J

SEDIMENTATION
SEDIMENTS OF THE NORTHERN MIDDLE AMERICA TRENCH,
W71-05844 02J

SUBAQUEOUS SLUMP STRUCTURES,
W71-05848 02J

SEDIMENTS OF THE MODERN NIGER DELTA A SUMMARY AND REVIEW,
W71-05856 02J

DEPOSITIONAL SEQUENCES AND SAND DISTRIBUTION IN THE POSTGLACIAL RHONE DELTA COMPLEX,
W71-05857 02J

SEDIMENTATION IN A MALAYSIAN HIGH TIDE TROPICAL DELTA,
W71-05858 02J

HYDROGRAPHY, SEDIMENT DISPERSAL, AND RECENT HISTORICAL DEVELOPMENT OF THE PO RIVER DELTA, ITALY,
W71-05859 02J

FACIES AND DEVELOPMENT OF THE COLORADO RIVER DELTA IN TEXAS,
W71-05860 02J

GEOLOGICAL, CHEMICAL, AND PHYSICAL ATTRIBUTES OF SEDIMENTS IN SENECA LAKE, NEW YORK,
W71-05890 02J

SEDIMENTS
A STUDY OF FRESHWATER SAND GRAIN SURFACES BY SCANNING ELECT RON MICROSCOPY,
W71-05887 07B

CHEMICAL CHARACTERIZATION OF BOTTOM SEDIMENTS,
W71-05981 05A

THE NET EXCHANGES OF PHOSPHORUS BY ESTUARINE SEDIMENTS IN FLOWING WATERS,
W71-06010 02J

POLLUTION BY SEDIMENT SOURCES AND THE DETACHMENT AND TRANSPORT PROCESSES,
W71-06430 05B

CHEMISTRY OF SEDIMENT IN WATER,
W71-06431 05B

LAND AND WATER MANAGEMENT FOR MINIMIZING SEDIMENT,
W71-06432 05G

SEEDLINGS
ENVIRONMENTAL EFFECTS ON WOOD PRODUCTION AND CAMBIAL ACTIVITY IN ZIZIPHUS SPINACHRISTI (L.) WILLD.,
W71-06214 02I

SEEDS
SEED TABLETS FOR PRECISION PLANTING LETTUCE,
W71-06224 03F

SEEPAGE
HYDRODYNAMIC EFFECTS OF SEEPAGE ON BED PARTICLES,
W71-05839 02J

SEEPAGE FACE EFFECTS IN UNSTEADY GROUNDWATER FLOW,
W71-06190 02F

POLLUTION OF AMERICAN COASTS BY OIL (IN GERMAN),
W71-06208 05B

SELECTIVE WITHDRAWAL
SELECTIVE WITHDRAWAL AT LAKE LIVINGSTON, PRELIMINARY EVALUATIONS, 1969,
W71-06193 05C

SELF-PURIFICATION
REMOVAL OF CONTAMINANTS FROM LAKE ONTARIO BY NATURAL

PROCESSES,
W71-05878 05G

ANTIBACTERIAL SUBSTANCES PRODUCED BY MARINE BACTERIA (IN FRENCH),
W71-06203 05C

STUDY OF THE INFLUENCE OF BDELLORIBRIO BACTERIOROUS IN MARINE SELF-PURIFICATION (IN FRENCH),
W71-06204 05C

SEMIARID CLIMATES
VARIATIONS IN WATER STRESS IN ONE-YEAR-OLD NEEDLES OF A PONDEROSA PINE,
W71-06057 02I

SEMIPERMEABLE MEMBRANES
STUDY OF MASS TRANSFER IN MEMBRANE PROCESSES,
W71-06233 03A

SENECA LAKE(NY)
GEOLOGICAL, CHEMICAL, AND PHYSICAL ATTRIBUTES OF SEDIMENTS IN SENECA LAKE, NEW YORK,
W71-05890 02J

SENSITIVITY ANALYSIS
SENSITIVITY ANALYSIS IN DECISION MAKING,
W71-05955 06B

SEPARATION TECHNIQUES
WASTE REDUCTION IN FOOD CANNING OPERATIONS,
W71-06257 05D

STORMWATER OVERFLOW GETS BAGGED.
W71-06341 05G

SIORM OVERFLOWS AND STORM SEWAGE,
W71-06367 05G

ALTERNATIVES TO SEPARATION OF COMBINED SEWERS,
W71-06374 05D

THE DISCHARGE OF STORM SEWAGE TO PUBLIC WATERS FROM AREAS OF GROUNDS WHICH ARE ENDANGERED BY OIL, IN CONNECTION WITH THE CLEAN WATER ACT FOR BERLIN,
W71-06388 05D

SEPCL(COMPUTER SYSTEM)
SETTLEMENT PROBLEM ORIENTED COMPUTER LANGUAGE,
W71-05915 08D

SEPTIC TANKS
LIQUID HANDLING OF POULTRY MANURE,
W71-06450 05D

SETTLEMENT(STRUCTURAL)
SETTLEMENT PROBLEM ORIENTED COMPUTER LANGUAGE,
W71-05915 08D

SETTLING BASINS
STRUCTURES PREVENT URBAN SEDIMENT DAMAGE,
W71-06425 04D

SEWAGE
O'HEARN V TOWN OF ADAMS (DAMAGES FOR OVERFLOW OF SEWAGE).
W71-05967 06E

SETTLING CHARACTERISTICS OF ACTIVATED SLUDGE AT LOW TEMPERATURE,
W71-06107 05D

A RATIONAL APPROACH TO THE DESIGN OF AERATED SEWAGE LAGOONS,
W71-06267 05D

STORM OVERFLOWS AND THE DISPOSAL OF STORM SEWAGE.
W71-06417 08A

SEWAGE DISPOSAL
BLACK V TOWN OF BESSEMER CITY (DAMAGE TO LAND BY SEWAGE PLANT).
W71-06086 06E

CRAGE V CITY OF BUFFALO (DUTY OF CITY TO PROVIDE FOR SEWAGE DISPOSAL).
W71-06170 06E

STATE BOARD OF HEALTH (DISPOSAL OF SEWAGE AND SOLID WASTES).
W71-06278 06E

CITY OF HARRISONVILLE V W S DICKEY CLAY MFG CO (ENJOINING CITY'S SEWAGE DISPOSAL INTO STREAM AS TEMPORARY NUISANCE).
W71-06304 06E

STORM OVERFLOWS AND STORM SEWAGE,
W71-06367 05G

WHITHER WATER POLLUTION CONTROL,
W71-06370 05G

SEWAGE EFFLUENTS
NORTH SIDE TREATMENT PLANT CHLORINATION,
W71-05925 05D

FE CL3 ADDITION EXPERIMENTS FOR IMPROVED EFFLUENT QUALITY AT THE CALUMET TREATMENT PLANT, INTERIM REPORT,
W71-05927 05D

CHARACTERISTICS OF SPARTINA MARSH WHICH IS RECEIVING TREATED MUNICIPAL SEWAGE WASTES,
W71-06014 02L

SEWAGE TREATMENT
NORTH SIDE TREATMENT PLANT CHLORINATION,
W71-05925 05D

FE CL3 ADDITION EXPERIMENTS FOR IMPROVED EFFLUENT QUALITY AT THE CALUMET TREATMENT PLANT, INTERIM REPORT,
W71-05927 05D

DEVELOPMENT OF DESIGN PARAMETERS FOR INTERSTATE REST AREA SEWAGE TREATMENT SYSTEMS,
W71-06040 05D

SETTLING CHARACTERISTICS OF ACTIVATED SLUDGE AT LOW TEMPERATURE,
W71-06107 05D

A RATIONAL APPROACH TO THE DESIGN OF AERATED SEWAGE LAGOONS,
W71-06267 05D

SURVEY OF DESALTING PROCESSES FOR USE IN WASTE WATER TREATMENT,
W71-06268 05D

RADIATION TREATMENT OF SEWAGE,
W71-06271 05D

DELAWARE RIVER BASIN COMM'N HEARING TO EXPAND THE COMPREHENSIVE PLAN.
W71-06274 06E

HEARING BY DELAWARE RIVER BASIN COMM'N TO EXPAND THE COMPREHENSIVE PLAN.
W71-06275 05G

MIDLAND DISTRICT CENTER.
W71-06331 05G

SOME ASPECTS OF SEWAGE TREATMENT AT COVENTRY,
W71-06366 05D

HOW TO THINK ABOUT INSTRUMENTATION AND CONTROL,
W71-06409 05G

EFFECTS OF SURFACE RUNOFF ON THE FEASIBILITY OF MUNICIPAL ADVANCED WASTE TREATMENT,
W71-06445 05D

SEWAGE TUNNELS
HYDRAULIC DESIGN OF SELF-CLEANING SEWAGE TUNNELS,
W71-06401 08B

SEWER CLEANING
THE SEWER HAD TO BE CLEANED BEFORE SNOWFALL,
W71-06396 05G

SEWER CONSTRUCTION
MAIN DRAINAGE,
W71-06422 08A

SEWER HYDRAULICS
A NEW TWIST (90 DEGREES IN FACT) TO SEGMENTED SEWER - PIPE DESIGN.
W71-06376 08A

PORTABLE RECORDING OF SEWER FLOW.
W71-06390 08B

RATIONAL 'RATIONAL' METHOD OF STORM DRAINAGE DESIGN.
W71-06393 08B

VELOCITY MEASUREMENTS IN SEWERS VITAL TO DESIGN AND MAINTENANCE,
W71-06394 08B

PRACTICAL HYDRAULICS FOR PUBLIC WORKS ENGINEER,
W71-06398 08B

INCREASING SEWAGE FLOW VELOCITY BY USING CHEMICAL ADDITIVES,
W71-06400 08B

HYDRAULIC DESIGN OF SELF-CLEANING SEWAGE TUNNELS,
W71-06401 08B

SEWER LINES
LOW-PRESSURE AIR TESTS FOR SEWER LINES,
W71-06299 08A

SEWER PIPE BEDDING
SOME THOUGHTS ON SEWER PIPE BEDDING,
W71-06412 08A

SEWERAGE
SELECTED URBAN STORM WATER RUNOFF ABSTRACTS (SECOND QUARTERLY ISSUE).
W71-06255 04C

GRANTS FOR PREPARATION OF COMPREHENSIVE AREA PLANS FOR WATER AND SEWER SYSTEMS.
W71-06284 06A

WATER TREATMENT - A GUIDE TO THE TREATMENT OF WATER AND EFFLUENTS PURIFICATION CHAPTER 13 - INTRODUCTORY SEWER SYSTEMS--OVERFLOWS-CONSERVANCY,
W71-06371 05D

PLASTIC RELINING OF SMALL-DIAMETER PIPES,
W71-06426 08G

SEWERS
CONTROL OF INFILTRATION IN SEWER SYSTEMS-DESIGN AND MAINTENANCE,

W71-06197 05D

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS (FIRST QUARTERLY ISSUE).
W71-06254 04C

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS (SECOND QUARTERLY ISSUE).
W71-06255 04C

INSTALLATION OF SOIL, WASTE AND DRAINAGE PIPING IN FILL OR UNSTABLE SOIL,
W71-06285 08A

LOW-PRESSURE AIR TESTS FOR SEWER LINES,
W71-06299 08A

WORK STARTS ON 11-MILE INTERCEPTOR TO SOLVE TORONTO'S SEWER PROBLEM.
W71-06337 08A

ISLAND CITY SOLVES TOUGH SEWERAGE PROBLEM.
W71-06346 08A

SEWERS UNDER ATTACK.
W71-06349 08G

WATER TREATMENT - A GUIDE TO THE TREATMENT OF WATER AND EFFLUENTS PURIFICATION CHAPTER 13 - INTRODUCTORY SEWER SYSTEMS--OVERFLOWS-CONSERVANCY,
W71-06371 05D

OVERFLOW STUDIES AT A SEWER SYSTEM OF A METROPOLITAN CITY,
W71-06373 08B

A NEW TWIST (90 DEGREES IN FACT) TO SEGMENTED SEWER - PIPE DESIGN.
W71-06376 08A

A RE-EXAMINATION OF THE STORM TANK PROBLEM,
W71-06377 05D

SOLVING A SEWER OVERFLOW PROBLEM,
W71-06387 08C

VELOCITY MEASUREMENTS IN SEWERS VITAL TO DESIGN AND MAINTENANCE,
W71-06394 08B

THE SEWER HAD TO BE CLEANED BEFORE SNOWFALL,
W71-06396 05G

STUDIES ON THE CHEMICAL CONTROL OF TREE ROOTS IN SEWER LINES,
W71-06397 04A

INCREASING SEWAGE FLOW VELOCITY BY USING CHEMICAL ADDITIVES,
W71-06400 08B

CALCAREOUS PIPE FOR SEWERS,
W71-06407 08F

NOTES ON WATER POLLUTION.
W71-06418 05G

MAIN DRAINAGE,
W71-06422 08A

SHALLOW SUBMERGED JET
THE MIXING OF A SHALLOW SUBMERGED HEATED WATER JET WITH AN AMBIENT RESERVOIR,
W71-06084 05C

SHARKS
METABOLISM OF QUINALDINE(2-METHYL-QUINOLINE). UPTAKE AND EXCRETION BY NURSE SHARKS,
W71-06324 05C

SHEAR
SHEARING EFFECTS ON SETTLING OF ACTIVATED SLUDGE,
W71-06029 05D

SHEAR FLOW
DIFFUSION FROM A CONTINUOUS SOURCE IN A UNIFORM SHEAR FLOW,
W71-05872 05B

SHEAR STRENGTH
REVIEW OF SHEARING STRENGTH OF ROCKFILL,
W71-05910 08D

SHELLFISH
SANITARY CONTROL OF SHELLFISH IN KOREA,
W71-06110 02L

SIMULATED VEGETATION
THE MECHANISM OF DIRECT RUNOFF FROM RAINFALL,
W71-06264 02G

SIMULATION ANALYSIS
STREAMFLOW SYNTHESIS,
W71-05946 04A

SIMULATING SNOWMELT HYDROGRAPHS FOR THE FRASER RIVER SYSTEM,
W71-06147 02A

SIMULATION OF RUNOFF FROM URBAN WATERSHEDS,
W71-06306 04C

SLOPE STABILITY
STABILITY OF ROCK SLOPES--GRAPHICAL METHODS,
W71-05909 02E

SLUDGE
MOISTURE TRANSPORT IN SLUDGE DEWATERING AND DRYING ON SAND BEDS,
W71-06031 05D

REMARKS ON THE DRIFT OF OILY WASTE IN THE BAY OF HELGOLAND (IN GERMAN),
W71-06206 05B

SLUDGE DIGESTION
STEPS TO SUCCESS IN WATER POLLUTION CONTROL,
W71-06379 05G

SLUDGE DISPOSAL
ULTIMATE DISPOSAL OF INDUSTRIAL WASTE AN OVERVIEW,
W71-06259 05E

SLUDGE TREATMENT
SOME ASPECTS OF SEWAGE TREATMENT AT COVENTRY,
W71-06366 05D

SMALL WATERSHEDS
FLOODS FROM SMALL DRAINAGE AREAS IN CALIFORNIA-A COMPILATION OF PEAK DATA OCTOBER 1958 TO SEPTEMBER 1969,
W71-06127 07C

SNOW LOADS
VARIATION OF GROUND SNOW LOADS IN BRITISH COLUMBIA,
W71-06140 02C

DEVELOPMENT OF SNOW LOAD DESIGN DATA FOR THE UNITED STATES,
W71-06141 02C

AN APPROACH TO SNOW LOAD EVALUATION,
W71-06142 02C

SNOW LOADS FOR THE DESIGN OF ROOFS IN CANADA,
W71-06143 08A

SNOW MANAGEMENT
SNOW AND RESERVOIR MANAGEMENT IN CANADA FOR THE COLUMBIA RIVER TREATY OPERATION,
W71-06134 02C

SNOW SURVEY TELEMETRY
SNOW SURVEY TELEMETRY NETWORKS AND FUTURE PLANS,
W71-06148 07A

SNOW SURVEYS
SNOW COURSE WEIGHTING PROCEDURE,
W71-06146 07C

SNOWMELT
WESTERN SNOW CONFERENCE.
W71-06133 02C

THE DEVELOPMENT AND APPLICATION OF A HYDROLOGIC MODEL AS AN OPERATIONAL TOOL,
W71-06135 02C

LABORATORY SIMULATION OF SNOWMELT,
W71-06139 02C

SIMULATING SNOWMELT HYDROGRAPHS FOR THE FRASER RIVER SYSTEM,
W71-06147 02A

SNOW SURVEY TELEMETRY NETWORKS AND FUTURE PLANS,
W71-06148 07A

SNOWMELT SIMULATION
LABORATORY SIMULATION OF SNOWMELT,
W71-06139 02C

SNOWPACKS
WESTERN SNOW CONFERENCE.
W71-06133 02C

DENSITIES OF PRAIRIE SNOWPACKS,
W71-06137 02C

VARIATION OF GROUND SNOW LOADS IN BRITISH COLUMBIA,
W71-06140 02C

DEVELOPMENT OF SNOW LOAD DESIGN DATA FOR THE UNITED STATES,
W71-06141 02C

AN APPROACH TO SNOW LOAD EVALUATION,
W71-06142 02C

SNOW LOADS FOR THE DESIGN OF ROOFS IN CANADA,
W71-06143 08A

SNOW SURVEY TELEMETRY NETWORKS AND FUTURE PLANS,
W71-06148 07A

SOCIAL ASPECTS
SOCIO-CULTURAL IMPACTS OF WATER RESOURCE DEVELOPMENT IN THE SANTIAM RIVER BASIN,
W71-05921 06B

WATER RESOURCES MANAGEMENT IN THE PUBLIC INTEREST,
W71-06314 06B

SOCIO-CULTURAL SYSTEM
SOCIO-CULTURAL IMPACTS OF WATER RESOURCE DEVELOPMENT IN THE SANTIAM RIVER BASIN,
W71-05921 06B

SOIL EROSION
LAND AND WATER MANAGEMENT FOR MINIMIZING SEDIMENT,

W71-06432 05G

SOIL MECHANICS
THE INFLUENCE OF STRAINS IN SOIL MECHANICS,
W71-05907 08D

ENGINEERING BEHAVIOR AND STRUCTURE OF COMPACTED CLAY,
W71-05908 08D

SETTLEMENT PROBLEM ORIENTED COMPUTER LANGUAGE,
W71-05915 08D

EXPERIMENTAL AND THEORETICAL INVESTIGATIONS OF A PASSIVE EARTH PRESSURE PROBLEM,
W71-05919 08D

SOIL MOISTURE
A COMPARISON OF WATER USE FOR HYBRID CORN IN THE BEKAA AND THE COASTAL PLAIN,
W71-06067 03F

FORMATION OF THE THERMAL REGIME IN SOILS ON IRRIGATED FIELDS IN PERMAFROST REGIONS,
W71-06070 02G

EFFECT OF IRRIGATION ON RECOVERY OF APPLIED NITROGEN BY COTTON,
W71-06216 03F

THE INFLUENCE OF VARIOUS SOIL MOISTURE-REGIMES ON THE YIELD AND QUALITY OF COTTON IN AN ARID ZONE,
W71-06217 03F

SOIL PRESSURE
EXPERIMENTAL AND THEORETICAL INVESTIGATIONS OF A PASSIVE EARTH PRESSURE PROBLEM,
W71-05919 08D

SOIL STRUCTURE
ENGINEERING BEHAVIOR AND STRUCTURE OF COMPACTED CLAY,
W71-05908 08D

SOIL SURVEYS
INFRARED PHOTOS CAN MAP SOILS,
W71-06058 07B

SOIL WATER
UREA CONVERSION TO AMMONIA IN WATERLOGGED SOILS,
W71-05866 02K

PREDICTION OF MOISTURE MOVEMENT IN EXPANSIVE CLAYS,
W71-06272 02G

SOILS
THE INFLUENCE OF STRAINS IN SOIL MECHANICS,
W71-05907 08D

BEHAVIOR OF SOIL AND FERTILIZER PHOSPHORUS IN RELATION TO WATER POLLUTION,
W71-06434 05B

SOIL-PLANT-WATER RELATIONSHIPS
THE SAN SIMON WATERSHED REVEGETATION,
W71-06223 04D

SOIL-WATER-PLANT RELATIONSHIP
GEOCHEMICAL SURVEY OF MISSOURI, PLANS AND PROGRESS FOR SECOND SIX-MONTH PERIOD (JANUARY-JUNE, 1970).
W71-05854 02K

SOIL-WATER-PLANT RELATIONSHIPS
GEOCHEMICAL SURVEY OF MISSOURI, PLANS AND PROGRESS FOR FIRST SIX-MONTH PERIOD (JULY-DECEMBER, 1969).
W71-05874 02K

INFRARED PHOTOS CAN MAP SOILS,
W71-06058 07B

HOW TO SELECT AND APPLY ZINC FERTILIZER,
W71-06059 03F

FORMATION OF THE THERMAL REGIME IN SOILS ON IRRIGATED FIELDS IN PERMAFROST REGIONS,
W71-06070 02G

YIELD REDUCTION BY CONTROLLED FLOODING OF CORN,
W71-06152 03F

ENVIRONMENTAL EFFECTS ON WOOD PRODUCTION AND CAMBIAL ACTIVITY IN ZIZIPHUS SPINACHRISTI (L.) WILLD.,
W71-06214 02I

SOLID WASTE DISPOSAL
SPECIAL STUDIES OF A SANITARY LANDFILL,
W71-06103 05B

SOLID WASTES
STATE BOARD OF HEALTH (DISPOSAL OF SEWAGE AND SOLID WASTES).
W71-06278 06E

SOUND IMPACT
SOCIO-CULTURAL IMPACTS OF WATER RESOURCE DEVELOPMENT IN THE SANTIAM RIVER BASIN,
W71-05921 06B

SOURCE OF WATER
WATER REQUIREMENTS FOR MANUFACTURING,
W71-06318 06D

SOUTHWEST ARKANSAS
WELL RECORDS, DEPTH-TO-WATER MEASUREMENTS, CHEMICAL ANALYSES OF GROUND WATER, DRILLERS LOGS, AND ELECTRIC-LOG INFORMATIO IN HEMPSTEAD, LAFAYETTE, LITTLE RIVER, MILLER, AND NEVADA COUNTIES, ARKANSAS,
W71-06229 04B

SOUTH-CENTRAL PENNSYLVANIA
GROUNDWATER RESOURCES OF THE LOYSVILLE AND MIFFLINTOWN QUADRANGLES IN SOUTH-CENTRAL PENNSYLVANIA,
W71-05853 04B

SPATIAL ANALYSIS
ECOLOGY AND SPATIAL ANALYSIS,
W71-06317 06F

SPECIFIC CAPACITY
CRITICAL OBSERVATIONS FOR HYDRAULIC MEASUREMENTS OF FIXED STORM-SEWAGE OVERFLOWS,
W71-06372 05G

SPECIFICATIONS
DESIGN CRITERIA FOR MUNICIPAL WASTE WATER TREATMENT PLANTS IN TENNESSEE,
W71-06043 05D

STABILITY ANALYSIS
STABILITY OF ROCK SLOPES--GRAPHICAL METHODS,
W71-05909 02E

STAGE-DISCHARGE RELATIONS
FLAT-VEE WEIRS IN ALLUVIAL CHANNELS,
W71-05849 08B

STANDARDS
DESIGN CRITERIA FOR MUNICIPAL WASTE WATER TREATMENT PLANTS IN TENNESSEE,
W71-06043 05D

WATER QUALITY STANDARDS.
W71-06054 05G

ACCOMPLISHMENTS AND GOALS,
W71-06449 05G

STATE GOVERNMENTS
VIEWS OF THE GOVERNORS ON TAX INCENTIVES AND EFFLUENT CHARGES (WATER POLLUTION CONTROL AND ABATEMENT).
W71-06052 05G

WATER QUALITY STANDARDS.
W71-06054 05G

GEORGE F FISH FARMS V STATE (STATE'S LIABILITY FOR FLOODING FARM).
W71-06163 06E

STATE JURISDICTION
WATER-USE LAW AND ADMINISTRATION IN WISCONSIN,
W71-06192 06E

STATE WATER PLANS
WATER RELATED LAND USE IN THE BEAR RIVER DRAINAGE AREA,
W71-06212 07C

WATER RELATED LAND USE IN THE UTAH LAKE DRAINAGE AREA,
W71-06213 07C

HYDROLOGIC INVENTORY OF THE UTAH LAKE DRAINAGE AREA,
W71-06218 02E

HYDROLOGIC INVENTORY OF THE UINTAH STUDY UNIT,
W71-06219 02E

HYDROLOGIC INVENTORY OF THE WEBER RIVER STUDY UNIT,
W71-06220 02E

STATISTICAL ANALYSIS(WINDS AND CURRENTS)
A CASE STUDY OF COASTAL CURRENTS IN LAKE MICHIGAN,
W71-06174 02H

STATISTICAL METHODS
SNOW COURSE WEIGHTING PROCEDURE,
W71-06146 07C

A CASE STUDY OF COASTAL CURRENTS IN LAKE MICHIGAN,
W71-06174 02H

STEEL
GALVANIZED BETH-CU-LOY STEEL SHEETS - FOR CULVERT PIPE AND UNDERDRAINS.
W71-06419 08G

CORRUGATED STEEL PIPE STORM SEWERS.
W71-06420 08G

STEEL PIPES
ISLAND CITY SOLVES TOUGH SEWERAGE PROBLEM.
W71-06346 08A

CORRUGATED STEEL PIPE STORM SEWERS.
W71-06420 08G

STILLING BASINS
EFFICIENCY OF HYDRAULIC JUMP,
W71-05850 08B

STORAGE
APPLIES EXISTING TECHNOLOGY FOR A CLEANER LAKE ERIE.
W71-06359 05G

STORAGE TANKS
IT'S IN THE BAG.

W71-06332 05G

STORAGE BLADDERS FOR SEWAGE.
W71-06344 05G

TANKS.
W71-06421 08G

STORAGE-YIELD FUNCTION
STREAMFLOW SYNTHESIS,
W71-05946 04A

STORM DRAINS
KELLY V CITY OF CAPE GIRARDEAU (LIABILITY OF CITY FOR FAILURE TO PROVIDE ADEQUATE STORM SEWERS).
W71-05997 06E

STEEL STORM SEWER SAVES MONEY FOR PHOENIX,
W71-06406 08G

PLASTIC RELINING OF SMALL-DIAMETER PIPES,
W71-06426 08G

STORM OVERFLOWS
RUBBER TANKS AID SEWAGE FIGHT,
W71-06290 05G

COMBINED SEWER SOLUTION SOUGHT IN SANDUSKY FIELD DEMONSTRATION.
W71-06352 05G

STORM WATER STORAGE SCHEME.
W71-06357 05G

STORM OVERFLOWS AND STORM SEWAGE,
W71-06367 05G

WATER TREATMENT - A GUIDE TO THE TREATMENT OF WATER AND EFFLUENTS PURIFICATION CHAPTER 13 - INTRODUCTORY SEWER SYSTEMS--OVERFLOWS-CONSERVANCY,
W71-06371 05D

CRITICAL OBSERVATIONS FOR HYDRAULIC MEASUREMENTS OF FIXED STORM-SEWAGE OVERFLOWS,
W71-06372 05G

METHOD OF AND MEANS FOR DEALING WITH STORM-WATER OVERFLOWS IN SEWERS AND LIKE DRAINAGE SYSTEMS,
W71-06375 08B

NEW REGULATIONS AND CONSTRUCTIONS OF STORM-SEWAGE OVERFLOWS, FOR THE RELIEF OF RECEIVING WATERS,
W71-06382 08B

NEW IDEAS FOR CALCULATING STORM WATER OVERFLOW SETTINGS AND THE DESIGN OF STORM WATER TANKS.
W71-06416 08A

NOTES ON WATER POLLUTION.
W71-06418 05G

STORM RUNOFF
SELECTED URBAN STORM WATER RUNOFF ABSTRACTS.
W71-06253 04C

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS (FIRST QUARTERLY ISSUE).
W71-06254 04C

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS (SECOND QUARTERLY ISSUE).
W71-06255 04C

A CRAZY IDEA ON URBAN WATER MANAGEMENT,
W71-06309 06B

STORM WATER STORAGE SCHEME.
W71-06357 05G

OVERFLOW STUDIES AT A SEWER SYSTEM OF A METROPOLITAN CITY,
W71-06373 08B

THE WRAY FLOOD DISASTER AND ITS EFFECTS ON THE PUBLIC HEALTH SERVICES,
W71-06386 05F

PORTABLE RECORDING OF SEWER FLOW.
W71-06390 08B

EXPERIMENTAL ESTIMATION OF DETENTION IN STORM SEWER SYSTEM,
W71-06404 08B

CLEANING OUR ENVIRONMENT-THE CHEMICAL BASIS FOR ACTION SECTION 2 - THE WATER ENVIRONMENT MUNICIPAL WASTE WATER TREATMENT.
W71-06415 05D

NEW IDEAS FOR CALCULATING STORM WATER OVERFLOW SETTINGS AND THE DESIGN OF STORM WATER TANKS.
W71-06416 08A

STORM OVERFLOWS AND THE DISPOSAL OF STORM SEWAGE.
W71-06417 08A

STRUCTURES PREVENT URBAN SEDIMENT DAMAGE,
W71-06425 04D

DEVELOPMENTS IN SEWER MONITORING EQUIPMENT AND TECHNIQUES,
W71-06428 08B

STORM SEWAGE
CHARACTERIZATION AND CONTROL OF COMBINED SEWER OVERFLOWS, SAN FRANCISCO,
W71-06326 08B

FREQUENCY OF STORM-SEWAGE OVERFLOWS. THE FREQUENCY OF STORM SEWAGE OVERFLOWS IN COMBINED SEWERAGE SYSTEMS IN CONNECTION WITH STORAGE AND PUMP CAPACITY, CONCLUSIONS FROM THE RAINFALL DATA OF THE KNMI FOR 1926-1962,
W71-06365 05G

SOME ASPECTS OF SEWAGE TREATMENT AT COVENTRY,
W71-06366 05D

STORM OVERFLOWS AND STORM SEWAGE,
W71-06367 05G

METHOD OF AND MEANS FOR DEALING WITH STORM-WATER OVERFLOWS IN SEWERS AND LIKE DRAINAGE SYSTEMS,
W71-06375 08B

NOTES ON WATER POLLUTION.
W71-06418 05G

STORM SEWERS
SELECTED URBAN STORM WATER RUNOFF ABSTRACTS.
W71-06253 04C

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS (FIRST QUARTERLY ISSUE).
W71-06254 04C

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS (SECOND QUARTERLY ISSUE).
W71-06255 04C

TRENCHER AND BOX SHIELD MAKE SEWER JOB ALMOST ONE-RIG OPERATION.
W71-06334 08C

STORMWATER SEWER DESIGN IN METRIC.
W71-06342 08A

LETTERS TO THE EDITOR--WATCH OUT FOR CROSS CONNECTIONS,
W71-06381 05G

EXPERIMENTAL ESTIMATION OF DETENTION IN STORM SEWER SYSTEM,
W71-06404 08B

STEEL STORM SEWER SAVES MONEY FOR PHOENIX,
W71-06406 08G

MODIFIED TRENCHER SLICES THROUGH FLINT-HARD ROCK,
W71-06411 08E

CORRUGATED STEEL PIPE STORM SEWERS.
W71-06420 08G

PLASTIC RELINING OF SMALL-DIAMETER PIPES,
W71-06426 08G

STORM TANK
MIDLAND DISTRICT CENTER.
W71-06331 05G

A RE-EXAMINATION OF THE STORM TANK PROBLEM,
W71-06377 05D

STORMWATER CONTROL
A BREAK FROM ACCEPTED PRACTICE . . . BRINGS STORM-WATER CONTROL WITHIN REACH OF OUR BOROUGH'S POCKETBOOK,
W71-06384 05G

STORMWATER QUALITY
CLEANING OUR ENVIRONMENT-THE CHEMICAL BASIS FOR ACTION SECTION 2 - THE WATER ENVIRONMENT MUNICIPAL WASTE WATER TREATMENT.
W71-06415 05D

STORMWATER SYSTEMS
WATER STORAGE METHODS -- FROM CUPPED HANDS TO COMPUTERS,
W71-06385 08A

STORMWATER TREATMENT
A RE-EXAMINATION OF THE STORM TANK PROBLEM,
W71-06377 05D

STRAIN
THE INFLUENCE OF STRAINS IN SOIL MECHANICS,
W71-05907 08D

STRATIFICATION
INTERNAL WAVES OF THE SECOND VERTICAL MODE IN LAKE HURON,
W71-05896 02H

THE EFFECTS OF THERMAL DISCHARGES ON THE STRATIFICATION CYCLE OF LAKES,
W71-06082 05C

STRATIFIED FLOW
A FIELD STUDY OF LANGMUIR CIRCULATIONS,
W71-05884 02H

INTERNAL WAVES OF THE SECOND VERTICAL MODE IN LAKE HURON,
W71-05896 02H

STREAM IMPROVEMENT
ALL YOU SEE IS THE STREAM,
W71-06280 04D

STREAM TEMPERATURES
SUMMARY OF DATA ON TEMPERATURE OF STREAMS IN NORTH CAROLINA,

1943-67,
W71-05855 07C

STREAMFLOW
STREAMFLOW SYNTHESIS,
W71-05946 04A

A PROPOSED STREAMFLOW-DATA PROGRAM FOR NEBRASKA,
W71-06128 07A

STATISTICAL SUMMARIES OF NEW JERSEY STREAMFLOW RECORDS,
W71-06228 07C

STREAMFLOW AUGMENTATION
POTENTIAL FOR STREAMFLOW AUGMENTATION BY GROUNDWATER PUMPING,
W71-06118 04B

STREAMFLOW FORECASTING
THE DESCHUTES RIVER HYDROGRAPH FORECAST,
W71-06144 04A

STREAMS
SUMMARY OF DATA ON TEMPERATURE OF STREAMS IN NORTH CAROLINA, 1943-67,
W71-05855 07C

SUBAQUEOUS SLUMP STRUCTURES
SUBAQUEOUS SLUMP STRUCTURES,
W71-05848 02J

SUBMERGENCE
VENICE IS SINKING INTO THE SEA,
W71-06120 02F

SUBOPTIMIZATION
OPTIMUM INVESTMENT IN WATER POLLUTION CONTROL,
W71-05938 06B

SUBSIDENCE
RECONNAISSANCE INVESTIGATION OF THE SUBSIDENCE OF VENICE AND SUGGESTED STEPS TOWARD ITS CONTROL,
W71-05870 02F

SUBSURFACE DRAINS
SOLUTION OF AN UNUSUAL SUBSURFACE DRAINAGE PROBLEM,
W71-06392 08A

SUBSURFACE INVESTIGATIONS
GEOHYDROLOGY OF THE AREA NEAR WOSCO EXPLORATORY HOLE NUMBER 1, UINTAH COUNTY, UTAH,
W71-06153 08H

SUCCULENTS
THE ROLE OF SUCCULENT HALOPHYTES IN THE WATER BALANCE OF SALT MARSH RODENTS,
W71-06073 02I

SULFATES
SODIUM, MAGNESIUM, AND CALCIUM SULFATE ION-PAIRS IN SEAWATER AT 25C,
W71-06166 02K

SURFACE AERATORS
FUNDAMENTAL ASPECTS OF SURFACE AERATOR PERFORMANCE AND DESIGN,
W71-06030 05D

SURFACE RUNOFF
REPORT ON TRAPEZOIDAL FLUME MODEL.
W71-05929 08B

SOLUTION OF AN UNUSUAL SUBSURFACE DRAINAGE PROBLEM,
W71-06392 08A

EFFECTS OF SURFACE RUNOFF ON THE FEASIBILITY OF MUNICIPAL ADVANCED WASTE TREATMENT,
W71-06445 05D

SURFACE WATERS
RADIOCHEMICAL ANALYSES OF WATER FROM SELECTED STREAMS, WELLS, SPRINGS, AND PRECIPITATION COLLECTED PRIOR TO REENTRY DRILLING, PROJECT RULISON,
W71-05842 05A

MERCURY USES IN CANADA AND THEIR POSSIBLE HAZARDS AS SOURCES OF MERCURY CONTAMINATION,
W71-05861 05B

WATER RESOURCES DEVELOPMENT IN LAOS.
W71-05865 06B

HORIZONTAL TRANSPORT IN A ROTATING BASIN OF PARABOLIC DEPTH PROFILE,
W71-05903 02E

WIND-DRIVEN CURRENTS IN A LONG ROTATING CHANNEL,
W71-05904 02E

NATURAL POLLUTION IN ARID LAND WATERS,
W71-06113 05B

ANIMAL WASTE RUNOFF--A MAJOR WATER QUALITY CHALLENGE,
W71-06114 05B

A PROPOSED STREAMFLOW-DATA PROGRAM FOR NEBRASKA,
W71-06128 07A

NITRATE POLLUTION OF WATER,
W71-06130 05B

PRELIMINARY REPORT ON THE WATER RESOURCES OF THE WAILUKU AREA,
W71-06155 02E

YORK RIVER BASIN COMPREHENSIVE WATER RESOURCES PLAN-VOLUME 1, INTRODUCTION.
W71-06230 06B

YORK RIVER BASIN COMPREHENSIVE WATER RESOURCES PLAN, VOLUME III-HYDROLOGIC ANALYSIS,
W71-06231 06B

THE LAW OF WATER--INTRODUCTION WATERCOURSES PERCOLATING AND SURFACE WATERS.
W71-06281 06E

THE DISCHARGE OF STORM SEWAGE TO PUBLIC WATERS FROM AREAS OF GROUNDS WHICH ARE ENDANGERED BY OIL, IN CONNECTION WITH THE CLEAN WATER ACT FOR BERLIN,
W71-06388 05D

SOURCES OF NITROGEN IN WATER SUPPLIES,
W71-06435 05B

SURFACE-GROUNDWATER RELATIONSHIPS
SOLUTION OF AN UNUSUAL SUBSURFACE DRAINAGE PROBLEM,
W71-06392 08A

SURFACTANTS
THE EFFECT OF CLAY MINERALS ON SURFACTANT BIODEGRADABILITY,
W71-06196 05D

DEVELOPMENT OF PHOSPHATE-FREE HOME LAUNDRY DETERGENTS,
W71-06247 05G

SURVEYS
WATER RESOURCES OF THE BLACK RIVER BASIN, SOUTHEASTERN MICHIGAN,
W71-05869 07C

SUSPENDED PIPELINE
SUSPENDED SEWAGE PIPELINE.
W71-06356 08A

SUSQUEHANNA RIVER BASIN
SUSQUEHANNA RIVER BASIN STUDY (SUMMARY),
W71-06227 06B

SYNOPTIC ANALYSIS
PACIFIC OCEAN INFLUENCE UPON CALIFORNIA RAINFALL,
W71-06115 02B

SYNTHETIC HYDROLOGY
EXTRAPOLATION OF HISTORICAL STORM DATA FOR ESTIMATING DESIGN WAVE HEIGHTS,
W71-06123 07C

SYSTEMS ANALYSIS
WATER RESOURCES SYSTEMS ANALYSIS OF DISCRETE DIFFERENTIAL DYNAMIC PROGRAMMING,
W71-05922 06A

SYSTEMS ENGINEERING
UNDERSTANDING SYSTEMS ENGINEERING,
W71-05918 06A

TASTE
'KEROSENE' TAINT IN SEA MULLET (MUGIL CEPHALUS LINNAEUS),
W71-06185 05C

TAX INCENTIVES
VIEWS OF THE GOVERNORS ON TAX INCENTIVES AND EFFLUENT CHARGES (WATER POLLUTION CONTROL AND ABATEMENT).
W71-06052 05G

TECHNICAL BASE
ALLIANCE FOR ACTION,
W71-06448 05G

TECHNOLOGY
ENVIRONMENTAL QUALITY MANAGEMENT,
W71-05941 06B

EXTERNALITIES, INFORMATION AND ALTERNATIVE COLLECTIVE ACTION,
W71-05964 06B

THE PRESENT STATE AND PROSPECTS OF DEVELOPMENT IN RADIOACTIVE WASTE MANAGEMENT IN THE USSR,
W71-06006 05E

TELEMETRY
WATER QUALITY TELEMETRY FINAL PROGRESS REPORT,
W71-06069 05G

SNOW SURVEY TELEMETRY NETWORKS AND FUTURE PLANS,
W71-06148 07A

THE AUTOMATIC HYDROLOGICAL RADIO REPORTING NETWORK, NEW ENGLAND DIVISION, CORPS OF ENGINEERS,
W71-06149 07A

TELEVISION
FORMATION EVALUATION BY INSPECTION WITH THE BOREHOLE TELEVIEWER,
W71-05916 07B

TELEVISION INSPECTION
TV INSPECTION AND IN-PLACE GROUTING OF SEWERS,
W71-06427 07B

TEMPERATURE
REACTION RATES OF PHOTOSYNTHESIS,
W71-06039 05C

THE MIXING OF A SHALLOW SUBMERGED HEATED WATER JET WITH AN AMBIENT RESERVOIR,
W71-06084 05C

ONE-DIMENSIONAL OPEN CHANNEL HEAT DISPERSION,
W71-06085 05G

THERMAL POLLUTION, AQUACULTURE AND PATHOBIOLOGY IN AQUATIC SYSTEMS,
W71-06092 05C

TEMPERATURE SELECTION AND HEAT RESISTANCE OF THE MOSQUITO FISH, GAMBUSIA AFFINIS,
W71-06180 05C

METHANOL REQUIREMENT AND TEMPERATURE EFFECTS IN WASTE WATER DENITRIFICATION,
W71-06246 05D

TEMPERATURE CONTROL
TEMPERATURE CONTROL IN OUTDOOR EXPERIMENTAL PONDS,
W71-06093 05C

TEMPERATURE STANDARDS
THERMAL CRITERIA - A MEASURE TO CONTROL THERMAL POLLUTION,
W71-06096 05C

TENNESSEE
DESIGN CRITERIA FOR MUNICIPAL WASTE WATER TREATMENT PLANTS IN TENNESSEE,
W71-06043 05D

COMMUNITY FACILITIES PLAN WATER AND SEWER PLAN PUBLIC IMPROVEMENTS PROGRAM AND CAPITAL BUDGET, DECHERD, TENNESSEE.
W71-06105 06B

TERTIARY TREATMENT
PHOSPHATE REMOVAL FORM TERTIARY EFFLUENT WITH ION EXCHANGE MATERIALS,
W71-05926 05D

TEST HOLES
AVAILABILITY OF GROUNDWATER IN DECATUR COUNTY, IOWA,
W71-06175 02F

TEST PROCEDURES
DETERMINATION OF THE BIODEGRADABILITY OF ANIONIC SYNTHETIC SURFACE ACTIVE AGENTS.
W71-05990 05D

TEST RESULTS
INITIAL EXPERIENCES ON THE 765 KV SYSTEM OF THE AMERICAN ELECTRIC POWER COMPANY (USA),
W71-05913 08C

TESTING
LOW-PRESSURE AIR TESTS FOR SEWER LINES,
W71-06299 08A

CALCAREOUS PIPE FOR SEWERS,
W71-06407 08F

TEXAS
DEPOSITIONAL SEQUENCES AND SAND DISTRIBUTION IN THE POSTGLACIAL RHONE DELTA COMPLEX,
W71-05857 02J

SEDIMENTATION IN A MALAYSIAN HIGH TIDE TROPICAL DELTA,
W71-05858 02J

FACIES AND DEVELOPMENT OF THE COLORADO RIVER DELTA IN TEXAS,
W71-05860 02J

INSTITUTIONAL FACTORS INFLUENCING WATER DEVELOPMENT IN TEXAS,
W71-05972 06B

THERMAL ACCLIMATION
THE INFLUENCE OF ACCLIMATION TEMPERATURE ON THE LIPID COMPOSITION OF FISH GILL MITOCHONDRIA,
W71-06321 05C

THERMAL BAR(GREAT LAKES)
SMALL-SCALE MODEL OF THE 'THERMAL BAR',
W71-05895 02H

THERMAL POLLUTION
PROBLEMS IN DISPOSAL OF WAST HEAT FROM STEAM-ELECTRIC PLANTS.
W71-05931 08A

FACTORS IN WASTE HEAT DISPOSAL ASSOCIATED WITH POWER GENERATION,
W71-05932 08A

INTRODUCTION, PROCEEDINGS OF 2ND THERMAL WORKSHOP OF UNITED STATES INTERNATIONAL BIOLOGICAL PROGRAM,
W71-06075 05C

THE EFFECTS OF THERMAL DISCHARGES ON THE STRATIFICATION CYCLE OF LAKES,
W71-06082 05C

THE EFFECT OF VARYING AND CONSTANT TEMPERATURES ON THE SIZE OF A MARINE COPEPOD,
W71-06083 05C

THE MIXING OF A SHALLOW SUBMERGED HEATED WATER JET WITH AN AMBIENT RESERVOIR,
W71-06084 05C

VERTICAL DIFFUSIVITY COEFFICIENT IN A THERMOCLINE,
W71-06088 02H

THERMAL POLLUTION, AQUACULTURE AND PATHOBIOLOGY IN AQUATIC SYSTEMS,
W71-06092 05C

THERMAL DISCHARGE A MODEL - PROTOTYPE COMPARISON,
W71-06095 05B

THERMAL CRITERIA - A MEASURE TO CONTROL THERMAL POLLUTION,
W71-06096 05C

THERMAL POWERPLANTS
PROBLEMS IN DISPOSAL OF WAST HEAT FROM STEAM-ELECTRIC PLANTS.
W71-05931 08A

FACTORS IN WASTE HEAT DISPOSAL ASSOCIATED WITH POWER GENERATION,
W71-05932 08A

COOLING WATER RESOURCES AND POWER GENERATION,
W71-06091 05G

POWER PLANTS EFFECTS OF CHLORINATION ON ESTUARINE PRIMARY PRODUCTION,
W71-06097 05C

THERMAL STRATIFICATION
A FIELD STUDY OF LANGMUIR CIRCULATIONS,
W71-05884 02H

SUMMER THERMAL STRUCTURE AND CIRCULATION OF CHEQUAMEGON BAY, LAKE SUPERIOR--A FLUCTUATING SYSTEM,
W71-05885 02H

SMALL-SCALE MODEL OF THE 'THERMAL BAR',
W71-05895 02H

DIURNAL CHANGES IN STRATIFICATION AND DISSOLVED OXYGEN IN THE SURFACE WATERS OF LAKE MICHIGAN,
W71-05900 02H

ON THE MECHANISM OF LANGMUIR CIRCULATIONS AND THEIR ROLE IN EPILIMNION MIXING,
W71-05975 02H

INDUCED HYPOLIMNION AERATION FOR WATER QUALITY IMPROVEMENT OF POWER RELEASES,
W71-06251 05G

THERMOCLINE
VERTICAL DIFFUSIVITY COEFFICIENT IN A THERMOCLINE,
W71-06088 02H

TIDAL MARSHES
MILLER V COMMONWEALTH (TITLE TO VIRGINIA TIDAL MARSHES).
W71-06161 06E

TIDAL WATERS
HOME REAL ESTATE LOAN AND INS CO V PARMELE (STATE MAY PASS TITLE TO NON-NAVIGABLE TIDAL WATERS).
W71-05980 06E

VENICE IS SINKING INTO THE SEA,
W71-06120 02F

TIME-STATE PREFERENCE
THE TREATMENT OF RISK AND UNCERTAINTY,
W71-05965 06B

TL50
THE EFFECTS OF THE HERBICIDES DIQUAT AND DICHLOBENIL (CASORON) ON POND INVERTEBRATES PART I. ACUTE TOXICITY,
W71-06181 05C

TMS MARIA XILAS
REMARKS ON THE DRIFT OF OILY WASTE IN THE BAY OF HELGOLAND (IN GERMAN),
W71-06206 05B

TORONTO
PLASTIC RELINING OF SMALL-DIAMETER PIPES,
W71-06426 08G

TORONTO(ONTARIO)
INVESTIGATIONS OF DAILY VARIATIONS IN CHEMICAL BACTERIOLOGICAL AND BIOLOGICAL PARAMETERS AT TWO LAKE ONTARIO LOCATIONS NEAR TORONTO, PART I--CHEMISTRY,
W71-05879 05A

TORPOR
THE ROLE OF SUCCULENT HALOPHYTES IN THE WATER BALANCE OF SALT MARSH RODENTS,
W71-06073 02I

TOXAPHENE
WATER CHEMISTRY OF TOXAPHENE - ROLE OF LAKE SEDIMENTS,
W71-05840 05B

TOXICITY
EFFECTS ON PH ON THE LIFE CYCLE OF THE MIDGE TANYTARSUS DISSIMILIS,
W71-05982 05C

TOXICITY OF ZINC, COPPER AND LEAD TO CHLOROPHYTA FROM

FLOWING WATERS,
W71-05991 05C

HEAVY METAL POLLUTION POLICY AND PROGRAM IMPLICATIONS FOR THE PROTECTION OF THE ECOSYSTEM,
W71-06078 05A

ACTIVITIES OF THE FOOD AND AGRICULTURE ORGANIZATION AND THE WORLD HEALTH ORGANIZATION REGARDING MERCURY,
W71-06079 05A

THE ABSORPTION OF MERCURY FROM FOOD, ITS SIGNIFICANCE AND NEW METHODS OF REMOVING MERCURY FROM THE BODY,
W71-06080 05C

EMBRYOTOXICITY OF MERCURY COMPOUNDS,
W71-06081 05C

THE EFFECTS OF THE HERBICIDES DIQUAT AND DICHLOBENIL (CASORON) ON POND INVERTEBRATES PART I. ACUTE TOXICITY,
W71-06181 05C

A POTENTIAL CONTROL FOR LEECHES,
W71-06322 05C

SOME EFFECTS OF ANTIMYCIN IN AN OLIGOTROPHIC LAKE,
W71-06323 05C

TRACE ELEMENTS
TRACE ELEMENTS IN LAKE ERIE,
W71-05880 05A

DISTRIBUTION OF TRACE METALS IN IMPOUNDMENTS,
W71-05971 05B

TRACE METALS
DISTRIBUTION OF TRACE METALS IN IMPOUNDMENTS,
W71-05971 05B

TRADE OFF
IMPLICATIONS OF WATER QUALITY LAWS FOR THE FEEDLOT INDUSTRY,
W71-06222 05G

TRANSACTION COSTS
THE ORGANIZATION OF ECONOMIC ACTIVITY ISSUES PERTINENT TO THE CHOICE OF MARKET VERSUS NONMARKET ALLOCATION,
W71-05966 06C

TRANSITE PIPE SYSTEM
PLASTIC FITTINGS SPEED LAYING OF SEWER PIPE.
W71-06338 08G

TRANSMISSION LINES
A STUDY OF THE DESIGN PARAMETERS OF UHV LINES,
W71-05914 08C

TRANSMISSION(ELECTRICAL)
TRANSMISSION IN THE 70'S,
W71-05912 08C

INITIAL EXPERIENCES ON THE 765 KV SYSTEM OF THE AMERICAN ELECTRIC POWER COMPANY (USA),
W71-05913 08C

TRANS-3-HEXADECANOIC ACID
ON THE OCCURRENCE OF TRANS-3-HEXADECANOIC ACID IN CHLORELLA CELLS, (IN RUSSIAN),
W71-05989 02K

TREATMENT EXPENDITURES
MARGINAL COSTS OF ALTERNATIVE LEVELS OF WATER QUALITY IN THE UPPER MISSISSIPPI RIVER,
W71-06191 05G

TREATMENT FACILITIES
DESIGN CRITERIA FOR MUNICIPAL WASTE WATER TREATMENT PLANTS IN TENNESSEE,
W71-06043 05D

CONTROL OF WASTES FROM WATER TREATMENT PLANTS,
W71-06200 05D

METHOD OF AND MEANS FOR DEALING WITH STORM-WATER OVERFLOWS IN SEWERS AND LIKE DRAINAGE SYSTEMS,
W71-06375 08B

A RE-EXAMINATION OF THE STORM TANK PROBLEM,
W71-06377 05D

HOW TO THINK ABOUT INSTRUMENTATION AND CONTROL,
W71-06409 05G

CLEANING OUR ENVIRONMENT-THE CHEMICAL BASIS FOR ACTION SECTION 2 - THE WATER ENVIRONMENT MUNICIPAL WASTE WATER TREATMENT.
W71-06415 05D

TREE RINGS
ENVIRONMENTAL EFFECTS ON WOOD PRODUCTION AND CAMBIAL ACTIVITY IN ZIZIPHUS SPINACHRISTI (L.) WILLD.,
W71-06214 02I

TREE ROOTS
STUDIES ON THE CHEMICAL CONTROL OF TREE ROOTS IN SEWER LINES,
W71-06397 04A

TREES
ENVIRONMENTAL EFFECTS ON WOOD PRODUCTION AND CAMBIAL ACTIVITY IN ZIZIPHUS SPINACHRISTI (L.) WILLD.,
W71-06214 02I

TRENCHER
MODIFIED TRENCHER SLICES THROUGH FLINT-HARD ROCK,
W71-06411 08E

TRENCHES
SCAPER PRODUCTION SPEEDS PIPE TRENCHING AT LOWER COSTS,
W71-06287 08C

TRESTLES
ALUMINUM PIPELINE FOR SEA OUTFALL SEWER.
W71-06355 08G

TRICKLING FILTERS
WASTE REDUCTION IN FOOD CANNING OPERATIONS,
W71-06257 05D

TROPHIC LEVEL
EUTROPHICATION CAUSE--EFFECT RELATIONSHIPS,
W71-06009 05C

TROPICAL REGIONS
SEDIMENTATION IN A MALAYSIAN HIGH TIDE TROPICAL DELTA,
W71-05858 02J

TROUT
A PRELIMINARY STUDY OF THE FEEDING RELATIONSHIPS OF FISH IN A HARD-WATER AND A SOFT-WATER STREAM IN SOUTHERN ENGLAND,
W71-06327 05C

TRUSS PIPE
ISLAND CITY SOLVES TOUGH SEWERAGE PROBLEM.
W71-06346 08A

TUNNELING
TOOLS OF THE BUILDER.
W71-06335 08C

TUNNELING MACHINES
TOOLS OF THE BUILDER.
W71-06335 08C

TRENCHLESS PIPELAYING DEMONSTRATED.
W71-06358 08C

TURBULENT DISPERSION
TURBULENT DISPERSION IN POROUS MATERIALS AS MODELED BY A MIXING CELL WITH STAGNANT ZONE,
W71-06122 02F

TURBULENT FLOW
TURBULENT DISPERSION IN POROUS MATERIALS AS MODELED BY A MIXING CELL WITH STAGNANT ZONE,
W71-06122 02F

TUSCON BASIN
OPERATIONS RESEARCH STUDY OF WATER RESOURCES - PART II,
W71-06307 06A

UINTAH BASIN
HYDROLOGIC INVENTORY OF THE UINTAH STUDY UNIT,
W71-06219 02E

ULTIMATE DISPOSAL
THE PRESENT STATE AND PROSPECTS OF DEVELOPMENT IN RADIOACTIVE WASTE MANAGEMENT IN THE USSR,
W71-06006 05E

ULTIMATE DISPOSAL OF INDUSTRIAL WASTE AN OVERVIEW,
W71-06259 05E

ULTRA HIGH VOLTAGE
TRANSMISSION IN THE 70'S,
W71-05912 08C

A STUDY OF THE DESIGN PARAMETERS OF UHV LINES,
W71-05914 08C

UNCERTAINTY
THE TREATMENT OF RISK AND UNCERTAINTY,
W71-05965 06B

UNCONFINED AQUIFER
COMPUTER METHODS FOR TRANSIENT ANALYSIS OF WATER-TABLE AQUIFERS,
W71-05920 02F

UNDERGROUND
GEOHYDROLOGY OF THE AREA NEAR WOSCO EXPLORATORY HOLE NUMBER 1, UINTAH COUNTY, UTAH,
W71-06153 08H

UNDERGROUND STRUCTURES
INTERNATIONAL BUILDING EXHIBITION - OLYMPIA LONDON 13-25 NOVEMBER 1969.
W71-06348 08A

PUBLIC WORKS EXHIBITION PREVIEW.
W71-06350 08G

UNDERWATER PIPELINE
UNDERWATER LINE SPANS 32 FEET BETWEEN SUPPORTS.
W71-06362 08F

UNIFORM FLOW
THE MECHANISM OF DIRECT RUNOFF FROM RAINFALL,
W71-06264 02G

UNITED STATES
UNITED STATES V BIG HORN LAND AND CATTLE CO (FORFEITURE OF RIGHT-OF-WAY ON PUBLIC LAND).

W71-05911 06E

JACOBS V UNITED STATES (COMPENSATION FOR LAND RENDERED MORE SUSCEPTIBLE TO OVERFLOW).
W71-06296 06E

UNIVERSITY OF CALIFORNIA AT LOS ANGELES
SEVENTH BIENNIAL CONFERENCE ON GROUNDWATER (PROGRESS, PRACTICE, AND POTENTIAL OF GROUNDWATER RECHARGE, DEVELOPMENT AND MANAGEMENT).
W71-06117 04B

URANIUM RADIOISOTOPES
RECOVERY OF URANIUM FROM NATURAL MINE WATERS BY COUNTERCURRENT ION EXCHANGE,
W71-05841 05D

URANIUM RECOVERY
RECOVERY OF URANIUM FROM NATURAL MINE WATERS BY COUNTERCURRENT ION EXCHANGE,
W71-05841 05D

URBAN HYDROLOGY
SIMULATION OF RUNOFF FROM URBAN WATERSHEDS,
W71-06306 04C

URBAN PLANNING
URBAN PLANNING ASPECTS OF WATER POLLUTION CONTROL,
W71-05944 06B

COMMUNITY FACILITIES PLAN WATER AND SEWER PLAN PUBLIC IMPROVEMENTS PROGRAM AND CAPITAL BUDGET, DECHERD, TENNESSEE.
W71-06105 06B

URBAN WATER MANAGEMENT
A CRAZY IDEA ON URBAN WATER MANAGEMENT,
W71-06309 06B

URBAN WATERSHEDS
SIMULATION OF RUNOFF FROM URBAN WATERSHEDS,
W71-06306 04C

URBANIZATION
GENESEE COUNTY ENVIRONMENTAL HEALTH, CONCLUSIONS REPORT, GENESEE COUNTY, MICHIGAN.
W71-05934 05B

WATER QUALITY AT THE DADE-COLLIER TRAINING AND TRANSITION AIRPORT, MIAMI INTERNATIONAL AIRPORT, AND COTTONMOUTH CAMP-EVERGLADES NATIONAL PARK, FLORIDA, NOVEMBER, 1969,
W71-06158 05A

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS.
W71-06253 04C

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS (SECOND QUARTERLY ISSUE).
W71-06255 04C

SIMULATION OF RUNOFF FROM URBAN WATERSHEDS,
W71-06306 04C

UREA HYDROLYSIS
UREA CONVERSION TO AMMONIA IN WATERLOGGED SOILS,
W71-05866 02K

UREAS
UREA CONVERSION TO AMMONIA IN WATERLOGGED SOILS,
W71-05866 02K

USSR
THE PRESENT STATE AND PROSPECTS OF DEVELOPMENT IN RADIOACTIVE WASTE MANAGEMENT IN THE USSR,
W71-06006 05E

UTAH
WATER RESOURCES OF THE HEBER-KAMAS-PARK CITY AREA, NORTH-CENTRAL UTAH,
W71-05852 02E

GEOHYDROLOGY OF THE AREA NEAR WOSCO EXPLORATORY HOLE NUMBER 1, UINTAH COUNTY, UTAH,
W71-06153 08H

WATER RELATED LAND USE IN THE BEAR RIVER DRAINAGE AREA,
W71-06212 07C

WATER RELATED LAND USE IN THE UTAH LAKE DRAINAGE AREA,
W71-06213 07C

HYDROLOGIC INVENTORY OF THE UTAH LAKE DRAINAGE AREA,
W71-06218 02E

HYDROLOGIC INVENTORY OF THE UINTAH STUDY UNIT,
W71-06219 02E

HYDROLOGIC INVENTORY OF THE WEBER RIVER STUDY UNIT,
W71-06220 02E

UTAH LAKE
HYDROLOGIC INVENTORY OF THE UTAH LAKE DRAINAGE AREA,
W71-06218 02E

VANCOUVER ISLANDS(CANADA)
EUTROPHICATION STUDIES OF A SHALLOW INLET ON VANCOUVER ISLAND,
W71-05988 02L

VAPOR PRESSURE
VARIATIONS IN WATER STRESS IN ONE-YEAR-OLD NEEDLES OF A PONDEROSA PINE,
W71-06057 02I

VELOCITY
VELOCITY MEASUREMENTS IN SEWERS VITAL TO DESIGN AND MAINTENANCE,
W71-06394 08B

VENICE(ITALY)
RECONNAISSANCE INVESTIGATION OF THE SUBSIDENCE OF VENICE AND SUGGESTED STEPS TOWARD ITS CONTROL,
W71-05870 02F

VENICE IS SINKING INTO THE SEA,
W71-06120 02F

VENTURA COUNTY(CAL)
FLOOD PLAIN INFORMATION, CALLEGUAS CREEK, VICINITY OF MOORPARK, VENTURA COUNTY, CALIFORNIA.
W71-05868 04A

VERTICAL DIFFUSIVITY COEFFICIENT
VERTICAL DIFFUSIVITY COEFFICIENT IN A THERMOCLINE,
W71-06088 02H

VIRGINIA
MILLER V COMMONWEALTH (TITLE TO VIRGINIA TIDAL MARSHES).
W71-06161 06E

OLIVER V CITY OF RICHMOND (COMPENSATION FOR STATE DIVERSION OF A NAVIGABLE STREAM).
W71-06162 06E

YORK RIVER BASIN COMPREHENSIVE WATER RESOURCES PLAN-VOLUME 1, INTRODUCTION.
W71-06230 06B

YORK RIVER BASIN COMPREHENSIVE WATER RESOURCES PLAN, VOLUME III-HYDROLOGIC ANALYSIS,
W71-06231 06B

STATE WATER CONTROL LAW.
W71-06277 06E

STATE BOARD OF HEALTH (DISPOSAL OF SEWAGE AND SOLID WASTES).
W71-06278 06E

WATER AND WASTE WATER WORKS OPERATIONS (CERTIFICATION OF WATER AND WASTE WATER OPERATIONS).
W71-06279 06E

WARNING SYSTEMS
THE AUTOMATIC HYDROLOGICAL RADIO REPORTING NETWORK, NEW ENGLAND DIVISION, CORPS OF ENGINEERS,
W71-06149 07A

WASTE DISPOSAL
BIOLOGICAL CONCEPTS AND INDUSTRIAL WASTE DISPOSAL PROBLEMS,
W71-06038 05D

ALTERNATIVES FOR THE TREATMENT AND DISPOSAL OF ANIMAL WASTES,
W71-06044 05D

SOLID WASTE DEPOSITION AND WATER PROTECTION (IN GERMAN),
W71-06210 05E

ULTIMATE DISPOSAL OF INDUSTRIAL WASTE AN OVERVIEW,
W71-06259 05E

WASTE DUMPS
SOLID WASTE DEPOSITION AND WATER PROTECTION (IN GERMAN),
W71-06210 05E

WASTE HEAT DISPOSAL
PROBLEMS IN DISPOSAL OF WAST HEAT FROM STEAM-ELECTRIC PLANTS.
W71-05931 08A

FACTORS IN WASTE HEAT DISPOSAL ASSOCIATED WITH POWER GENERATION,
W71-05932 08A

WASTE PRODUCTION
INTRODUCTION ISSUES IN FOOD PRODUCTION AND CLEAN WATER,
W71-06429 05G

WASTE TREATMENT
TWENTY YEARS OF INDUSTRIAL WASTE TREATMENT,
W71-06037 05D

SOLID WASTE DEPOSITION AND WATER PROTECTION (IN GERMAN),
W71-06210 05E

APPLIES EXISTING TECHNOLOGY FOR A CLEANER LAKE ERIE.
W71-06359 05G

OPTIMIZING WASTE TREATMENT CONTROL SYSTEMS,
W71-06414 05D

WASTE WATER
NORTH SIDE TREATMENT PLANT CHLORINATION,
W71-05925 05D

FE CL3 ADDITION EXPERIMENTS FOR IMPROVED EFFLUENT QUALITY AT THE CALUMET TREATMENT PLANT, INTERIM REPORT,
W71-05927 05D

WASTE WATER DISPOSAL
EFFECT OF FEEDLOT LAGOON WATER ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF SOILS,
W71-05974 05C

SOME FACTORS TO BE CONSIDERED IN THE DESIGN OF WASTE DISPOSAL WELLS,
W71-06199 05D

CONTROL OF WASTES FROM WATER TREATMENT PLANTS,
W71-06200 05D

AERIAL PHOTOGRAPHIC TRACING OF PULP MILL EFFLUENT IN MARINE WATERS,
W71-06258 05B

WASTE WATER FACILITIES
CONSTRUCTION COST REQUIREMENTS FOR WATER AND WASTE WATER FACILITIES.
W71-06347 05D

WASTE WATER TREATMENT
NORTH SIDE TREATMENT PLANT CHLORINATION,
W71-05925 05D

PHOSPHATE REMOVAL FORM TERTIARY EFFLUENT WITH ION EXCHANGE MATERIALS,
W71-05926 05D

FE CL3 ADDITION EXPERIMENTS FOR IMPROVED EFFLUENT QUALITY AT THE CALUMET TREATMENT PLANT, INTERIM REPORT,
W71-05927 05D

TWENTY YEARS OF INDUSTRIAL WASTE TREATMENT,
W71-06037 05D

DEVELOPMENT OF DESIGN PARAMETERS FOR INTERSTATE REST AREA SEWAGE TREATMENT SYSTEMS,
W71-06040 05D

SURVEY OF DESALTING PROCESSES FOR USE IN WASTE WATER TREATMENT,
W71-06042 05D

DESIGN CRITERIA FOR MUNICIPAL WASTE WATER TREATMENT PLANTS IN TENNESSEE,
W71-06043 05D

ALTERNATIVES FOR THE TREATMENT AND DISPOSAL OF ANIMAL WASTES,
W71-06044 05D

HYDRAULIC OVERLOADING-FACT OR FICTION,
W71-06198 05D

CONTROL OF WASTES FROM WATER TREATMENT PLANTS,
W71-06200 05D

CASE HISTORIES IMPROVED ACTIVATED SLUDGE PLANT PERFORMANCE BY OPERATIONS CONTROL,
W71-06201 05D

METHANOL REQUIREMENT AND TEMPERATURE EFFECTS IN WASTE WATER DENITRIFICATION,
W71-06246 05D

SURVEY OF DESALTING PROCESSES FOR USE IN WASTE WATER TREATMENT,
W71-06268 05D

CLEANING OUR ENVIRONMENT-THE CHEMICAL BASIS FOR ACTION SECTION 2 - THE WATER ENVIRONMENT MUNICIPAL WASTE WATER TREATMENT.
W71-06415 05D

OXIDATION DITCH TREATMENT OF SWINE WASTES, SUMMARY REPORT,
W71-06442 05D

WASTES
ANIMAL WASTE RUNOFF--A MAJOR WATER QUALITY CHALLENGE,
W71-06114 05B

GOVERNMENTAL RESPONSIBILITY FOR WASTE MANAGEMENT IN URBAN REGIONS,
W71-06282 05G

WATER ALLOCATION(POLICY)
IMPROVING WATER RESOURCE ALLOCATION THROUGH DEMAND-ORIENTED WATER POLICY,
W71-06316 06B

WATER ANALYSIS
A PORTABLE MULTIPARAMETER WATER QUALITY KIT,
W71-06157 05A

METHODS FOR CHEMICAL ANALYSIS OF FRESH WATERS.
W71-06159 02K

WATER BALANCE
LAKE CHAMPLAIN IN RELATION TO REGIONAL WATER SUPPLY,
W71-05875 03B

WATER CHEMISTRY
THE USE OF CONCENTRATIONS OF ELECTROLYTES AND NATURALLY FLUORESCENT MATERIALS TO STUDY WATER MASS MOVEMENTS IN A FRESHWATER 'ESTUARY',
W71-05877 02L

TRACE ELEMENTS IN LAKE ERIE,
W71-05880 05A

DISSOLVED MINERAL QUALITY OF GREAT LAKES WATERS,
W71-05883 05A

GEOCHEMICAL SYSTEMS IN ONONDAGA LAKE (CENTRAL NEW YORK STATE) COMPARED WITH THE GREAT LAKES,
W71-05888 02H

METHODS FOR CHEMICAL ANALYSIS OF FRESH WATERS.
W71-06159 02K

SODIUM, MAGNESIUM, AND CALCIUM SULFATE ION-PAIRS IN SEAWATER AT 25C,
W71-06166 02K

WATER CIRCULATION
THE GENERATION OF LANGMUIR CIRCULATIONS BY THE EDDY PRESSURE OF SURFACE WAVES,
W71-05871 02H

REMOVAL OF CONTAMINANTS FROM LAKE ONTARIO BY NATURAL PROCESSES,
W71-05878 05G

A FIELD STUDY OF LANGMUIR CIRCULATIONS,
W71-05884 02H

SUMMER THERMAL STRUCTURE AND CIRCULATION OF CHEQUAMEGON BAY, LAKE SUPERIOR--A FLUCTUATING SYSTEM,
W71-05885 02H

WIND INDUCED CIRCULATION PATTERN IN A ROTATING MODEL OF LAKE ERIE,
W71-05891 02H

STATISTICAL ANALYSIS OF CURRENTS AT TWO NEAR-BY STATIONS IN LAKE MICHIGAN, SUMMER, 1967,
W71-05893 02H

HYDRAULIC AND WIND-INDUCED CIRCULATION IN A MODEL OF A GREAT LAKE,
W71-05897 02H

SOME UNUSUAL SURFACE WATER TEMPERATURE PATTERNS IN THE GREAT LAKES, AS DETECTED BY AIRBORNE RADIATION THERMOMETER SURVEYS,
W71-05898 07B

ON THE MECHANISM OF LANGMUIR CIRCULATIONS AND THEIR ROLE IN EPILIMNION MIXING,
W71-05975 02H

JULY CURRENTS NEAR THE SOUTH SHORE OF LAKE ONTARIO,
W71-05978 02H

WATER CONSERVATION
WATER USE BY COTTON FROM LOW AND MODERATELY SALINE STATIC WATER TABLES,
W71-06221 03C

SEED TABLETS FOR PRECISION PLANTING LETTUCE,
W71-06224 03F

WATER CONTRACTS
KIRK V MAUMEE VALLEY ELECTRIC CO (LEASE OF WATER RIGHTS IN CANAL SUBJECT TO STATE'S RIGHT TO ABANDON CANAL).
W71-06171 06E

WATER CONVEYANCE
MASTER PLAN FOR THE DEVELOPMENT OF WATER DISTRIBUTION FACILITIES FOR GENESEE COUNTY, ENGINEERING REPORT.
W71-05933 08A

WATER DEMAND
PROVIDING REASONABLE WATER SERVICE,
W71-05942 06D

IMPROVING WATER RESOURCE ALLOCATION THROUGH DEMAND-ORIENTED WATER POLICY,
W71-06316 06B

WATER DEMAND QUALITY
ECONOMIC ASPECTS,
W71-06447 05G

WATER DISPOSAL
ALTERNATIVES FOR THE TREATMENT AND DISPOSAL OF ANIMAL WASTES,
W71-06044 05D

WATER DISTRIBUTION
MASTER PLAN FOR THE DEVELOPMENT OF WATER DISTRIBUTION FACILITIES FOR GENESEE COUNTY, ENGINEERING REPORT.
W71-05933 08A

WATER DISTRIBUTION(APPLIED)
RESONANCE IN PRESSURIZED PIPING SYSTEMS,
W71-05905 08B

WATER DISTRICTS
RURAL WATER DISTRICTS--HERE IS WHY THEY ARE NEEDED,
W71-06061 06B

WATER EQUIVALENT
DENSITIES OF PRAIRIE SNOWPACKS,
W71-06137 02C

SNOW COURSE WEIGHTING PROCEDURE,
W71-06146 07C

WATER LAW
WATER-USE LAW AND ADMINISTRATION IN WISCONSIN,
W71-06192 06E

CONNECTICUT WATER LAW JUDICIAL ALLOCATION OF WATER RESOURCES,

W71-06273 06E

THE LAW OF WATER--INTRODUCTION WATERCOURSES PERCOLATING AND SURFACE WATERS.
W71-06281 06E

WATER MANAGEMENT
LAND AND WATER MANAGEMENT FOR MINIMIZING SEDIMENT,
W71-06432 05G

WATER MANAGEMENT(APPLIED)
RURAL WATER DISTRICTS--HERE IS WHY THEY ARE NEEDED,
W71-06061 06B

OPTIMIZATION TECHNIQUES FOR WATER RESOURCE SYSTEMS,
W71-06062 06A

IMPLICATIONS OF WATER QUALITY LAWS FOR THE FEEDLOT INDUSTRY,
W71-06222 05G

A CRAZY IDEA ON URBAN WATER MANAGEMENT,
W71-06309 06B

WATER POLICY
WATER, WATER EVERYWHERE---BUT A STUDY OF THE POLITICO-ADMINISTRATIVE ASPECTS OF WATER DEVELOPMENT IN MONTANA,
W71-06226 06E

IMPROVING WATER RESOURCE ALLOCATION THROUGH DEMAND-ORIENTED WATER POLICY,
W71-06316 06B

WATER POLLUTION
PLANKTON REDUCTION IN THE REVERSED FLOW WATERWAYS OF THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO,
W71-05924 05B

THE ECOLOGY AND OCEANOGRAPHY OF SEWER OUTFALLS,
W71-05928 06G

GENESEE COUNTY ENVIRONMENTAL HEALTH, CONCLUSIONS REPORT, GENESEE COUNTY, MICHIGAN.
W71-05934 05B

A MODEL OF PUBLIC DECISIONS ILLUSTRATED BY A WATER POLLUTION POLICY PROBLEM,
W71-05939 06A

ENVIRONMENTAL QUALITY MANAGEMENT,
W71-05941 06B

URBAN PLANNING ASPECTS OF WATER POLLUTION CONTROL,
W71-05944 06B

THE ROLE OF INCENTIVES, PENALTIES, AND REWARDS IN ATTAINING EFFECTIVE POLICY,
W71-05959 06B

THE ENFORCEMENT PHASE OF POLLUTION ABATEMENT THE ROLE OF THE ARMY ENGINEERS,
W71-06055 05G

MAN-MADE SOURCES OF MERCURY,
W71-06077 05B

BLACK V TOWN OF BESSEMER CITY (DAMAGE TO LAND BY SEWAGE PLANT).
W71-06086 06E

THE FACTS BEHIND THE MERCURY,
W71-06100 05A

A STUDY OF THE BEHAVIOR OF OIL SPILLS IN THE ARCTIC,
W71-06101 05B

STUDY OF EQUIPMENT AND METHODS FOR REMOVING OR DISPERSING OIL FROM OPEN WATERS,
W71-06106 05G

WATER AND MAN'S HEALTH,
W71-06108 05F

NATURAL POLLUTION IN ARID LAND WATERS,
W71-06113 05B

POSSIBILITY OF STUDYING THE EFFECTS OF POLLUTION ON BENTHIC ORGANISMS EMPLOYING IMMERSED PANELS (IN FRENCH),
W71-06205 05C

LIQUID WASTE EFFLUENTS FROM A NUCLEAR FUEL REPROCESSING PLANT,
W71-06269 05B

ABSTRACT OF PROCEEDINGS, HAZARDOUS POLLUTING SUBSTANCES SYMPOSIUM ANNEX 1 TO STUDY ON CONTROL OF HAZARDOUS POLLUTING SUBSTANCES, SEPT. 14-16, 1970. NEW ORLEANS, LA.
W71-06270 05B

W71-06270 05B

CERTIFICATES OF FINANCIAL RESPONSIBILITY (OIL POLLUTION).
W71-06276 06E

CITY OF HARRISONVILLE V W S DICKEY CLAY MFG CO (ENJOINING CITY'S SEWAGE DISPOSAL INTO STREAM AS TEMPORARY NUISANCE).
W71-06304 06E

MODELING AND CONTROL OF THE POLLUTION OF WATER RESOURCES SYSTEMS VIA MULTILEVEL APPROACH,
W71-06311 06A

WHITHER WATER POLLUTION CONTROL,
W71-06370 05G

POLLUTION BY SEDIMENT SOURCES AND THE DETACHMENT AND TRANSPORT PROCESSES,
W71-06430 05B

LEGAL ASPECTS,
W71-06446 05G

ALLIANCE FOR ACTION,
W71-06448 05G

ACCOMPLISHMENTS AND GOALS,
W71-06449 05G

WATER POLLUTION ABATEMENT
THE LIFE OF MICROBES IN THE SEA AND THE CURRENT POLLUTION OUTLOOK (IN FRENCH),
W71-06202 05C

WATER POLLUTION CONTROL
REMOVAL OF CONTAMINANTS FROM LAKE ONTARIO BY NATURAL PROCESSES,
W71-05878 05G

GENESEE COUNTY ENVIRONMENTAL HEALTH, CONCLUSIONS REPORT, GENESEE COUNTY, MICHIGAN.
W71-05934 05B

STRATEGIES FOR ENVIRONMENTAL MANAGEMENT,
W71-05935 06B

ORGANIZING WATER POLLUTION CONTROL THE SCOPE AND STRUCTURE OF RIVER BASIN AUTHORITIES,
W71-05936 06F

WATER POLLUTION CONTROL, RIVER BASIN AUTHORITIES AND ECONOMIC INCENTIVES SOME CURRENT POLICY ISSUES,
W71-05937 06B

OPTIMUM INVESTMENT IN WATER POLLUTION CONTROL,
W71-05938 06B

THE ENVIRONMENTAL LAWSUIT TRADITIONAL DOCTRINES AND EVOLVING THEORIES TO CONTROL POLLUTION,
W71-06048 05G

WATER POLLUTION PROBLEMS AND CONTROL PROGRAMS IN MICHIGAN'S PORTION OF THE GREAT LAKES.
W71-06053 05G

THE ENFORCEMENT PHASE OF POLLUTION ABATEMENT THE ROLE OF THE ARMY ENGINEERS,
W71-06055 05G

STUDY OF EQUIPMENT AND METHODS FOR REMOVING OR DISPERSING OIL FROM OPEN WATERS,
W71-06106 05G

WATER QUALITY MANAGEMENT PROBLEMS IN ARID REGIONS.
W71-06111 05G

THE LIFE OF MICROBES IN THE SEA AND THE CURRENT POLLUTION OUTLOOK (IN FRENCH),
W71-06202 05C

POLLUTION OF AMERICAN COASTS BY OIL (IN GERMAN),
W71-06208 05B

IMPLICATIONS OF WATER QUALITY LAWS FOR THE FEEDLOT INDUSTRY,
W71-06222 05G

STATE WATER CONTROL LAW.
W71-06277 06E

MODELING AND CONTROL OF THE POLLUTION OF WATER RESOURCES SYSTEMS VIA MULTILEVEL APPROACH,
W71-06311 06A

STORM WATER TREATMENT AT CLEVELAND,
W71-06389 05D

WATER POLLUTION CONTROL EQUIPMENT
STUDY OF EQUIPMENT AND METHODS FOR REMOVING OR DISPERSING OIL FROM OPEN WATERS,
W71-06106 05G

WATER POLLUTION DETECTION
ABSTRACT OF PROCEEDINGS, HAZARDOUS POLLUTING SUBSTANCES SYMPOSIUM ANNEX 1 TO STUDY ON CONTROL OF HAZARDOUS POLLUTING SUBSTANCES, SEPT. 14-16, 1970. NEW ORLEANS, LA.
W71-06270 05B

WATER POLLUTION EFFECTS
EFFECT OF FEEDLOT LAGOON WATER ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF SOILS,
W71-05974 05C

MUSSELS (UNIONIDAE) OF THE RED RIVER VALLEY IN NORTH DAKOTA AND MINNESOTA, USA,
W71-06001 05C

INFLUENCE OF INDUSTRIAL EFFLUENTS ON ARTHROPODS OF THE MARINE SUPRALITTORAL ZONE, (IN GERMAN),
W71-06003 05C

STUDIES OF MARINE ESTUARINE ECOSYSTEMS DEVELOPING WITH TREATED SEWAGE WASTES,
W71-06012 02L

BENTHIC PRODUCTIVITY,
W71-06020 02L

PHYTOPLANKTON POPULATIONS A PRELIMINARY REPORT,
W71-06022 02L

DEGRADATION OF WATER QUALITY IN IRRIGATION RETURN FLOWS,
W71-06063 03F

EFFECTS OF ALKYL BENZENE SULFONATE ON BREEDING BEHAVIOR OF FLAGFISHES, JORDANELLA FLORIDAE,
W71-06184 05C

SOME FACTORS INFLUENCING TOXICITY OF LINEAR ALKYLATE SULFONATE (LAS) TO THE BLUEGILL,
W71-06260 05C

WATER POLLUTION SOURCES
POLLUTION FROM MINES IN THE 'NEW LEAD BELT' OF SOUTH EASTERN MISSOURI,
W71-05837 05A

MERCURY USES IN CANADA AND THEIR POSSIBLE HAZARDS AS SOURCES OF MERCURY CONTAMINATION,
W71-05861 05B

SOME VARIATION IN THE QUALITY OF WATER FROM THE SOURCE AND MOUTH OF THE NIAGARA RIVER,
W71-05881 05A

SURFACE WATER INPUTS OF IODINE, BROMINE, AND CHLORINE TO LAKE HURON,
W71-05882 05B

DISSOLVED MINERAL QUALITY OF GREAT LAKES WATERS,
W71-05883 05A

GENESEE COUNTY ENVIRONMENTAL HEALTH, CONCLUSIONS REPORT, GENESEE COUNTY, MICHIGAN.
W71-05934 05B

POLLUTION - ARE FERTILIZERS AT FAULT,
W71-05996 05B

WATER POLLUTION PROBLEMS AND CONTROL PROGRAMS IN MICHIGAN'S PORTION OF THE GREAT LAKES.
W71-06053 05G

WATER QUALITY MANAGEMENT PROBLEMS IN ARID REGIONS.
W71-06111 05G

PROBLEMS OF POLLUTION OF IRRIGATION WATERS IN ARID REGIONS,
W71-06112 05B

NATURAL POLLUTION IN ARID LAND WATERS,
W71-06113 05B

ANIMAL WASTE RUNOFF--A MAJOR WATER QUALITY CHALLENGE,
W71-06114 05B

NITRATE POLLUTION OF WATER,
W71-06130 05B

WATER QUALITY AT THE DADE-COLLIER TRAINING AND TRANSITION AIRPORT, MIAMI INTERNATIONAL AIRPORT, AND COTTONMOUTH CAMP-EVERGLADES NATIONAL PARK, FLORIDA, NOVEMBER, 1969,
W71-06158 05A

THE MONOCACY RIVER-PHYSICAL, CHEMICAL AND BACTERIOLOGICAL WATER QUALITY REPORT NUMBER 1, MARCH-DECEMBER 1966,
W71-06176 05B

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS (SECOND QUARTERLY ISSUE).
W71-06255 04C

CERTIFICATES OF FINANCIAL RESPONSIBILITY (OIL POLLUTION).
W71-06276 06E

WATER POTENTIAL
VARIATIONS IN WATER STRESS IN ONE-YEAR-OLD NEEDLES OF A PONDEROSA PINE,
W71-06057 02I

EFFECT OF TIME OF EXPOSURE TO SALINITY ON GROWTH, WATER STATUS AND SALT ACCUMULATION IN BEAN PLANTS,
W71-06074 02I

WATER PROJECT ANALYSIS
MEASURING INTANGIBLE BENEFITS--SOME NEEDED RESEARCH,
W71-06313 06B

WATER PURIFICATION
DEVELOPMENT OF NEUTRON ACTIVATION FOR INVESTIGATION OF WATER CLARIFICATION,
W71-06265 05D

WATER QUALITY
INVESTIGATIONS OF DAILY VARIATIONS IN CHEMICAL BACTERIOLOGICAL AND BIOLOGICAL PARAMETERS AT TWO LAKE ONTARIO LOCATIONS NEAR TORONTO, PART I--CHEMISTRY,
W71-05879 05A

SOME VARIATION IN THE QUALITY OF WATER FROM THE SOURCE AND MOUTH OF THE NIAGARA RIVER,
W71-05881 05A

DISSOLVED MINERAL QUALITY OF GREAT LAKES WATERS,
W71-05883 05A

WATER POLLUTION CONTROL, RIVER BASIN AUTHORITIES AND ECONOMIC INCENTIVES SOME CURRENT POLICY ISSUES,
W71-05937 06B

A MODEL OF PUBLIC DECISIONS ILLUSTRATED BY A WATER POLLUTION POLICY PROBLEM,
W71-05939 06A

75 YEARS OF IMPROVEMENT IN WATER SUPPLY QUALITY,
W71-05943 06E

THE 'PROBLEM SHED' AS A UNIT FOR ENVIRONMENTAL CONTROL,
W71-05945 06B

EVALUATION OF AN AUTOMATIC CHEMICAL ANALYSIS MONITOR FOR WATER QUALITY PARAMETERS,
W71-06005 05A

WATER QUALITY MANAGEMENT PROBLEMS IN ARID REGIONS.
W71-06111 05G

WATER QUALITY OF THE DELAWARE RIVER ESTUARY, JULY THROUGH DECEMBER 1967,
W71-06156 05A

A PORTABLE MULTIPARAMETER WATER QUALITY KIT,
W71-06157 05A

THE MONOCACY RIVER-PHYSICAL, CHEMICAL AND BACTERIOLOGICAL WATER QUALITY REPORT NUMBER 1, MARCH-DECEMBER 1966,
W71-06176 05B

MARGINAL COSTS OF ALTERNATIVE LEVELS OF WATER QUALITY IN THE UPPER MISSISSIPPI RIVER,
W71-06191 05G

A GENERAL REVIEW OF CONTINUOUS WATER QUALITY ANALYSIS INSTRUMENTATION,
W71-06295 05B

LAND USE FUNCTION IN WATER QUALITY MANAGEMENT,
W71-06310 06B

ECONOMIC ASPECTS,
W71-06447 05G

ACCOMPLISHMENTS AND GOALS,
W71-06449 05G

WATER QUALITY ACT
IMPLICATIONS OF WATER QUALITY LAWS FOR THE FEEDLOT INDUSTRY,
W71-06222 05G

WATER QUALITY CONTROL
PLANKTON REDUCTION IN THE REVERSED FLOW WATERWAYS OF THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO,
W71-05924 05B

GENESEE COUNTY ENVIRONMENTAL HEALTH, CONCLUSIONS REPORT, GENESEE COUNTY, MICHIGAN.
W71-05934 05B

WATER POLLUTION OBSERVATIONS ON CONNECTICUT'S RESPONSE,
W71-06047 05G

WATER QUALITY STANDARDS.
W71-06054 05G

WATER QUALITY TELEMETRY FINAL PROGRESS REPORT,
W71-06069 05G

WATER QUALITY MODELING AND PREDICTION,
W71-06186 05G

INDUCED AIR MIXING OF LARGE BODIES OF POLLUTED WATER,
W71-06245 05G

INDUCED HYPOLIMNION AERATION FOR WATER QUALITY IMPROVEMENT OF POWER RELEASES,
W71-06251 05G

STATE WATER CONTROL LAW.
W71-06277 06E

LAND USE FUNCTION IN WATER QUALITY MANAGEMENT,
W71-06310 06B

WATER QUALITY MANAGEMENT
LAND USE FUNCTION IN WATER QUALITY MANAGEMENT,
W71-06310 06B

WATER QUALITY MONITOR
A GENERAL REVIEW OF CONTINUOUS WATER QUALITY ANALYSIS INSTRUMENTATION,
W71-06295 05B

WATER QUALITY MONITORING
DISSOLVED MINERAL QUALITY OF GREAT LAKES WATERS,
W71-05883 05A

WATER REQUIREMENTS
WATER REQUIREMENTS FOR MANUFACTURING,
W71-06318 06D

WATER RESOURCE DEVELOPMENT
ECONOMIC ANALYSIS IN NATURAL RESOURCE PROGRAMS,
W71-05940 06B

THE ABSENCE OF KNOWLEDGE OF DISTRIBUTIONAL IMPACTS AN OBSTACLE TO EFFECTIVE POLICY ANALYSIS AND DECISIONS,
W71-05963 06B

WATER RESOURCE PLANNING
COMPREHENSIVE ENVIRONMENTAL PLANNING,
W71-05950 06B

WATER RESOURCE SYSTEMS
MODELING AND CONTROL OF THE POLLUTION OF WATER RESOURCES SYSTEMS VIA MULTILEVEL APPROACH,
W71-06311 06A

WATER RESOURCES
WATER RESOURCES OF THE HEBER-KAMAS-PARK CITY AREA, NORTH-CENTRAL UTAH,
W71-05852 02E

GROUNDWATER RESOURCES OF THE LOYSVILLE AND MIFFLINTOWN QUADRANGLES IN SOUTH-CENTRAL PENNSYLVANIA,
W71-05853 04B

WATER-RESOURCES APPRAISAL OF THE COLUMBUS SALT MARSH-SODA SPRING VALLEY AREA, MINERAL AND ESMERALDA COUNTIES, NEVADA,
W71-05862 04B

WATER RESOURCES OF THE BLACK RIVER BASIN, SOUTHEASTERN MICHIGAN,
W71-05869 07C

GROUNDWATER RECONNAISSANCE OF THE GREEN RIVER BASIN, SOUTHWESTERN WYOMING,
W71-05902 07C

WATER AND MAN'S HEALTH,
W71-06108 05F

A HYDROLOGIC ANALYSIS OF THE NEW JERSEY PINE BARRENS REGION,
W71-06125 02A

DIRECTORY OF PERSONNEL, WATER RESOURCES, WESTERN NEW YORK.
W71-06150 09A

PRELIMINARY REPORT ON THE WATER RESOURCES OF THE WAILUKU AREA,
W71-06155 02E

AVAILABILITY OF GROUNDWATER IN DECATUR COUNTY, IOWA,
W71-06175 02F

YORK RIVER BASIN COMPREHENSIVE WATER RESOURCES PLAN-VOLUME 1, INTRODUCTION.
W71-06230 06B

CONNECTICUT WATER LAW JUDICIAL ALLOCATION OF WATER RESOURCES,
W71-06273 06E

OPERATIONS RESEARCH STUDY OF WATER RESOURCES - PART II,
W71-06307 06A

A CRAZY IDEA ON URBAN WATER MANAGEMENT,
W71-06309 06B

WATER RESOURCES DEVELOPMENT
WATER RESOURCES OF NASSAU AND SUFFOLK COUNTIES,
W71-05843 03D

DEVELOPMENT OF WATER RESOURCES IN ASIA AND THE FAR EAST-REPORT OF THE NINTH SESSION OF THE BIENNIAL REGIONAL CONFERENCE ON WATER RESOURCES DEVELOPMENT.
W71-05864 06B

WATER RESOURCES DEVELOPMENT IN LAOS.
W71-05865 06B

WATER RESOURCES OF THE BLACK RIVER BASIN, SOUTHEASTERN MICHIGAN,
W71-05869 07C

LAKE CHAMPLAIN IN RELATION TO REGIONAL WATER SUPPLY,
W71-05875 03B

MASTER PLAN FOR THE DEVELOPMENT OF WATER DISTRIBUTION FACILITIES FOR GENESEE COUNTY, ENGINEERING REPORT.
W71-05933 08A

THE CONSERVANCY DISTRICT LAW (OUTLINE AND TEXT OF OHIO CONSERVANCY DISTRICT LAW).
W71-06046 06E

INTERBASIN DIVERSION OF WATER AN ANNOTATED BIBLIOGRAPHY,
W71-06071 07C

THE WOODSMAN'S ASSAULTS ON THE DOMAIN OF THE CATTLEMAN,
W71-06072 03F

NORTH CAROLINA WATER PLAN PROGRESS REPORT CHAPTER 6, RESEARCH (DRAFT).
W71-06116 06B

POTENTIAL FOR STREAMFLOW AUGMENTATION BY GROUNDWATER PUMPING,
W71-06118 04B

SALINE ARTESIAN WATER AS A SUPPLEMENT,
W71-06124 03C

GROUNDWATER RESOURCES OF NELSON COUNTY, NORTHEASTERN NORTH DAKOTA,
W71-06160 07C

AVAILABILITY OF GROUNDWATER IN CHARLES COUNTY, MARYLAND,
W71-06168 02F

WELL RECORDS, DEPTH-TO-WATER MEASUREMENTS, CHEMICAL ANALYSES OF GROUND WATER, DRILLERS LOGS, AND ELECTRIC-LOG INFORMATION IN HEMPSTEAD, LAFAYETTE, LITTLE RIVER, MILLER, AND NEVADA COUNTIES, ARKANSAS,
W71-06229 04B

YORK RIVER BASIN COMPREHENSIVE WATER RESOURCES PLAN, VOLUME III-HYDROLOGIC ANALYSIS,
W71-06231 06B

SOIL AND WATER LOANS LAND CONSERVATION AND DEVELOPMENT LOANS.
W71-06283 06E

OPERATIONS RESEARCH STUDY OF WATER RESOURCES - PART II,
W71-06307 06A

THE BUREAU OF RECLAMATION'S ROLE IN AMERICA'S GROWTH,
W71-06308 06E

WATER RESOURCES MANAGEMENT IN THE PUBLIC INTEREST,
W71-06314 06B

PUBLIC PARTICIPATION IN WATER PLANNING A CRITIQUE OF THEORY, DOCTRINE, AND PRACTICE,
W71-06315 06B

ECOLOGY AND SPATIAL ANALYSIS,
W71-06317 06F

WATER RESOURCES MANAGEMENT
WATER RESOURCES MANAGEMENT IN THE PUBLIC INTEREST,
W71-06314 06B

WATER RESOURCES PLANNING ACT
SUSQUEHANNA RIVER BASIN STUDY (SUMMARY),
W71-06227 06B

WATER RESOURCES SYSTEMS ENGINEERING
OPTIMIZATION TECHNIQUES FOR WATER RESOURCE SYSTEMS,
W71-06062 06A

WATER REUSE
A STUDY OF MUNICIPAL WASTE WATER RECLAMATION,
W71-06041 05D

ECONOMICS OF COMBINING DISTILLED SEAWATER AND RENOVATED WASTE WATER AS A NEW SOURCE OF MUNICIPAL WATER SUPPLY,
W71-06238 03A

METHANOL REQUIREMENT AND TEMPERATURE EFFECTS IN WASTE WATER DENITRIFICATION,
W71-06246 05D

CLEANING OUR ENVIRONMENT-THE CHEMICAL BASIS FOR ACTION SECTION 2 - THE WATER ENVIRONMENT MUNICIPAL WASTE WATER TREATMENT.
W71-06415 05D

LIQUID HANDLING OF POULTRY MANURE,
W71-06450 05D

WATER RIGHTS
INSTITUTIONAL FACTORS INFLUENCING WATER DEVELOPMENT IN TEXAS,
W71-05972 06B

GIVENS V CHANDLER (INJUNCTION TO PROHIBIT INTERFERENCE WITH WATER SUPPLY).
W71-05976 06E

STATE V MIDDLETOWN HYDRAULIC CO (VALIDITY OF WATER RIGHTS RESERVATION IN GRANT OF CANAL PROPERTY TO STATE).
W71-06098 06E

KIRK V MAUMEE VALLEY ELECTRIC CO (LEASE OF WATER RIGHTS IN CANAL SUBJECT TO STATE'S RIGHT TO ABANDON CANAL).
W71-06171 06E

WATER SOURCES
LAKE CHAMPLAIN IN RELATION TO REGIONAL WATER SUPPLY,
W71-05875 03B

WATER STORAGE
DENSITIES OF PRAIRIE SNOWPACKS,
W71-06137 02C

WATER SUPPLIES QUALITY
ECONOMIC ASPECTS,
W71-06447 05G

WATER SUPPLY
MCGEHEE V WILLIAMS (CONTRACT BETWEEN CITIES FOR PROVISION OF WATER).
W71-05836 06E

MASTER PLAN FOR THE DEVELOPMENT OF WATER DISTRIBUTION FACILITIES FOR GENESEE COUNTY, ENGINEERING REPORT.
W71-05933 08A

PROVIDING REASONABLE WATER SERVICE,
W71-05942 06D

75 YEARS OF IMPROVEMENT IN WATER SUPPLY QUALITY,
W71-05943 06E

PUBLIC WATER FOR RURAL AREAS AND SMALL TOWNS,
W71-05973 06D

RURAL WATER DISTRICTS--HERE IS WHY THEY ARE NEEDED,
W71-06061 06B

SEVENTH BIENNIAL CONFERENCE ON GROUNDWATER (PROGRESS, PRACTICE, AND POTENTIAL OF GROUNDWATER RECHARGE, DEVELOPMENT AND MANAGEMENT).
W71-06117 04B

ECONOMICS OF COMBINING DISTILLED SEAWATER AND RENOVATED WASTE WATER AS A NEW SOURCE OF MUNICIPAL WATER SUPPLY,
W71-06238 03A

AN ECONOMIC ANALYSIS OF THE INTERTEMPORAL ALLOCATION OF GROUNDWATER IN THE CENTRAL OGALLALA FORMATION,
W71-06266 04B

GRANTS FOR PREPARATION OF COMPREHENSIVE AREA PLANS FOR WATER AND SEWER SYSTEMS.
W71-06284 06A

ECONOMIC DESIGN OF CENTRAL WATER SUPPLY SYSTEMS FOR MEDIUM SIZED TOWNS,
W71-06312 06B

IMPROVING WATER RESOURCE ALLOCATION THROUGH DEMAND-ORIENTED WATER POLICY,
W71-06316 06B

WATER SUPPLY SYSTEMS
ECONOMIC DESIGN OF CENTRAL WATER SUPPLY SYSTEMS FOR MEDIUM SIZED TOWNS,
W71-06312 06B

WATER TABLE
WATER USE BY COTTON FROM LOW AND MODERATELY SALINE STATIC WATER TABLES,
W71-06221 03C

WATER TEMPERATURE
SUMMARY OF DATA ON TEMPERATURE OF STREAMS IN NORTH CAROLINA, 1943-67,
W71-05855 07C

SOME UNUSUAL SURFACE WATER TEMPERATURE PATTERNS IN THE GREAT LAKES, AS DETECTED BY AIRBORNE RADIATION THERMOMETER SURVEYS,
W71-05898 07B

SEASONAL VARIATIONS OF TEMPERATURE, DRIFT, AND HEAT EXCHANGE IN SURFACE WATERS OFF THE WEST COAST OF SOUTH AMERICA,
W71-06094 02L

THERMAL DISCHARGE A MODEL - PROTOTYPE COMPARISON,
W71-06095 05B

EFFECT OF TEMPERATURE ON THE PH OF SEAWATER,
W71-06167 02K

WATER TEMPERATURE-PH RELATIONS
EFFECT OF TEMPERATURE ON THE PH OF SEAWATER,
W71-06167 02K

WATER TRANSPORTATION
ABSTRACT OF PROCEEDINGS, HAZARDOUS POLLUTING SUBSTANCES SYMPOSIUM ANNEX 1 TO STUDY ON CONTROL OF HAZARDOUS POLLUTING SUBSTANCES, SEPT. 14-16, 1970. NEW ORLEANS, LA.
W71-06270 05B

WATER TREATMENT
75 YEARS OF IMPROVEMENT IN WATER SUPPLY QUALITY,
W71-05943 06E

A CRITICAL SURVEY OF USE OF COST-BENEFIT ANALYSIS IN PUBLIC FINANCE,
W71-05948 06C

SURVEY OF DESALTING PROCESSES FOR USE IN WASTE WATER TREATMENT,
W71-06042 05D

HYDRAULIC OVERLOADING-FACT OR FICTION,
W71-06198 05D

CONTROL OF WASTES FROM WATER TREATMENT PLANTS,
W71-06200 05D

WATER USE
WATER USE BY APPALACHIAN MANUFACTURERS,
W71-06319 06D

WATER UTILITIES
PROVIDING REASONABLE WATER SERVICE,
W71-05942 06D

WATER UTILIZATION
WATER CONSERVATION BY REMOVAL OF PHREATOPHYTES,
W71-06154 03B

WATER RELATED LAND USE IN THE BEAR RIVER DRAINAGE AREA,
W71-06212 07C

WATER RELATED LAND USE IN THE UTAH LAKE DRAINAGE AREA,
W71-06213 07C

HYDROLOGIC INVENTORY OF THE UTAH LAKE DRAINAGE AREA,
W71-06218 02E

HYDROLOGIC INVENTORY OF THE UINTAH STUDY UNIT,
W71-06219 02E

HYDROLOGIC INVENTORY OF THE WEBER RIVER STUDY UNIT,
W71-06220 02E

AN ECONOMIC ANALYSIS OF THE INTERTEMPORAL ALLOCATION OF GROUNDWATER IN THE CENTRAL OGALLALA FORMATION,
W71-06266 04B

WATER REQUIREMENTS FOR MANUFACTURING,
W71-06318 06D

WATER WORKS
WATER AND WASTE WATER WORKS OPERATIONS (CERTIFICATION OF WATER AND WASTE WATER OPERATIONS).
W71-06279 06E

WATER YIELD
WESTERN SNOW CONFERENCE.
W71-06133 02C

SNOW SURVEY TELEMETRY NETWORKS AND FUTURE PLANS,
W71-06148 07A

WATERCOURSES(LEGAL)
THE LAW OF WATER--INTRODUCTION WATERCOURSES PERCOLATING AND SURFACE WATERS.
W71-06281 06E

WATERFOWL
EFFECTS OF OIL POLLUTION ON WATERFOWL A STUDY OF SALVAGE METHODS,
W71-05983 05C

WATERFRONTS
WATERFRONT LAND USE IN THE AUSTRALIAN STATE CAPITALS,
W71-06065 06B

WATERSHED MANAGEMENT
FRONTIERS IN CONSERVATION.
W71-06129 04C

WATERSHEDS(BASINS)
STORM WATER TREATMENT AT CLEVELAND,
W71-06389 05D

WATERSHEDS(BASIN)
STORM WATER RETARDING BASINS SOLVE URBAN DRAINAGE PROBLEMS,
W71-06364 05G

WATER-RELATED LAND USE
WATER RELATED LAND USE IN THE BEAR RIVER DRAINAGE AREA,
W71-06212 07C

WATER RELATED LAND USE IN THE UTAH LAKE DRAINAGE AREA,
W71-06213 07C

WATER-SHED MANAGEMENT
THE SAN SIMON WATERSHED REVEGETATION,
W71-06223 04D

WAVE FORCES(LAKE ERIE)
WAVE FORCES IN LAKE ERIE,
W71-05894 02H

WAVES(WATER)
THE GENERATION OF LANGMUIR CIRCULATIONS BY THE EDDY PRESSURE OF SURFACE WAVES,
W71-05871 02H

WAVE FORCES IN LAKE ERIE,
W71-05894 02H

INTERNAL WAVES OF THE SECOND VERTICAL MODE IN LAKE HURON,
W71-05896 02H

VISUAL WAVE OBSERVATIONS ALONG THE LAKE MICHIGAN SHORE,
W71-05899 02H

EXTRAPOLATION OF HISTORICAL STORM DATA FOR ESTIMATING DESIGN WAVE HEIGHTS,
W71-06123 07C

WEATHER
SOME UNUSUAL SURFACE WATER TEMPERATURE PATTERNS IN THE GREAT LAKES, AS DETECTED BY AIRBORNE RADIATION THERMOMETER SURVEYS,
W71-05898 07B

WEATHER MODIFICATION
THE SURFACE INSTRUMENT NETWORK OF THE UPPER COLORADO RIVER PILOT PROJECT,
W71-06136 07A

WEATHERING
THE ORIGIN OF THE LABYRINTH, WRIGHT VALLEY, ANTARCTICA,
W71-05847 02J

WEBER RIVER
HYDROLOGIC INVENTORY OF THE WEBER RIVER STUDY UNIT,
W71-06220 02E

WEED CONTROL
ALGAECIDAL EVALUATION AND ENVIRONMENTAL STUDY OF MAT PRODUCING BLUEGREEN ALGAE,
W71-06102 04A

ESTABLISHMENT OF PERENNIAL FORAGES I. SUBSEQUENT YIELDS II. SUBSEQUENT ROOT DEVELOPMENT,
W71-06215 03F

WEIGHTING FUNCTIONS
PROJECT DESIGN AND EVALUATION WITH MULTIPLE OBJECTIVES,
W71-05962 06B

FLAT-VEE WEIRS IN ALLUVIAL CHANNELS,
W71-05849 08B

WATER TREATMENT - A GUIDE TO THE TREATMENT OF WATER AND EFFLUENTS PURIFICATION CHAPTER 13 - INTRODUCTORY SEWER SYSTEMS--OVERFLOWS-CONSERVANCY,
W71-06371 05D

WELFARE ECONOMICS
INSTITUTIONAL OBSTACLES TO REALLOCATING GOVERNMENT EXPENDITURES,
W71-05961 06B

WELL DATA
AVAILABILITY OF GROUNDWATER IN DECATUR COUNTY, IOWA,
W71-06175 02F

WELL LOGGING
FORMATION EVALUATION BY INSPECTION WITH THE BOREHOLE TELEVIEWER,
W71-05916 07B

WELLS
GIVENS V CHANDLER (INJUNCTION TO PROHIBIT INTERFERENCE WITH WATER SUPPLY).
W71-05976 06E

WEST VIRGINIA
UNION SAND AND GRAVEL CO V NORTHCOTT (TITLE TO LAND BETWEEN HIGH AND LOW WATER MARKS).
W71-05979 06E

STATE V MOUNTS (BOUNDARIES ON NON-NAVIGABLE STREAMS WHERE SURVEY DIFFERS FROM NATURAL MONUMENTS).
W71-06007 06E

WESTERN NORTH AMERICA
PACIFIC OCEAN INFLUENCE UPON CALIFORNIA RAINFALL,
W71-06115 02B

WESTERN SNOW CONFERENCE
WESTERN SNOW CONFERENCE.
W71-06133 02C

WESTERN U
THE WOODSMAN'S ASSAULTS ON THE DOMAIN OF THE CATTLEMAN,
W71-06072 03F

WIND TUNNELS
LABORATORY SIMULATION OF SNOWMELT,
W71-06139 02C

WINDS
HYDRAULIC AND WIND-INDUCED CIRCULATION IN A MODEL OF A GREAT LAKE,
W71-05897 02H

LABORATORY SIMULATION OF SNOWMELT,
W71-06139 02C

A CASE STUDY OF COASTAL CURRENTS IN LAKE MICHIGAN,
W71-06174 02H

WIND-DRIVEN WATER CURRENTS
WIND-DRIVEN CURRENTS IN A LONG ROTATING CHANNEL,
W71-05904 02E

WISCONSIN
WATER-USE LAW AND ADMINISTRATION IN WISCONSIN,
W71-06192 06E

WITHDRAWAL
RECONNAISSANCE INVESTIGATION OF THE SUBSIDENCE OF VENICE AND SUGGESTED STEPS TOWARD ITS CONTROL,
W71-05870 02F

WOOD PRODUCTS
PINYON-JUNIPER CONTROL WHERE. WHY,
W71-06225 04D

WYOMING
GROUNDWATER RECONNAISSANCE OF THE GREEN RIVER BASIN, SOUTHWESTERN WYOMING,
W71-05902 07C

YORK RIVER BASIN(VIRGINIA)
YORK RIVER BASIN COMPREHENSIVE WATER RESOURCES PLAN-VOLUME 1, INTRODUCTION.
W71-06230 06B

YORK RIVER BASIN COMPREHENSIVE WATER RESOURCES PLAN, VOLUME III-HYDROLOGIC ANALYSIS,
W71-06231 06B

ZINC
TOXICITY OF ZINC, COPPER AND LEAD TO CHLOROPHYTA FROM FLOWING WATERS,
W71-05991 05C

HOW TO SELECT AND APPLY ZINC FERTILIZER,
W71-06059 03F

ZOOPLANKTON
A STUDY OF RELATIONSHIPS BETWEEN ZOOPLANKTON ABUNDANCE AND SELECTED ENVIRONMENTAL VARIABLES IN THE PAMLICO RIVER ESTUARY OF EASTERN NORTH CAROLINA,
W71-05985 02I

SOME EFFECTS OF ANTIMYCIN IN AN OLIGOTROPHIC LAKE,
W71-06323 05C

2-4-D
HERBICIDE RESIDUES IN AGRICULTURAL WATER FROM CONTROL OF AQUATIC AND BANK WEEDS,
W71-06440 05B

AUTHOR INDEX

AAGAARD, P. M.
EXTRAPOLATION OF HISTORICAL STORM DATA FOR ESTIMATING DESIGN WAVE HEIGHTS,
W71-06123 07C

ABBOTT, J. L.
USE ANIMAL MANURE EFFECTIVELY,
W71-06454 05D

EFFECT OF SOIL TEMPERATURE ON THE AVAILABILITY OF PHOSPHORUS IN ANIMAL MANURES,
W71-06455 05C

ABOABA, F. O.
PHYSICAL PROPERTIES AND PROCESSING CHARACTERISTICS OF MACROPHYTES AS RELATED TO MECHANICAL HARVESTING,
W71-06188 04A

ABOUKHALED, A.
A COMPARISON OF WATER USE FOR HYBRID CORN IN THE BEKAA AND THE COASTAL PLAIN,
W71-06067 03F

ADAM, R.
POLLUTION OF AMERICAN COASTS BY OIL (IN GERMAN),
W71-06208 05B

ADKINS, GEORGE G.
FACTORS IN WASTE HEAT DISPOSAL ASSOCIATED WITH POWER GENERATION,
W71-05932 08A

AHRNSBRAK, W. F.
SUMMER THERMAL STRUCTURE AND CIRCULATION OF CHEQUAMEGON BAY, LAKE SUPERIOR--A FLUCTUATING SYSTEM,
W71-05885 02H

AITKEN, A. P.
STORM WATER RETARDING BASINS SOLVE URBAN DRAINAGE PROBLEMS,
W71-06364 05G

ALEXANDER, SAMUEL S.
RESEARCH ON PIEZODIALYSIS - SECOND REPORT,
W71-06236 03A

ALLEN, J. R. L.
SEDIMENTS OF THE MODERN NIGER DELTA A SUMMARY AND REVIEW,
W71-05856 02J

AMEMIYA, MINORU
LAND AND WATER MANAGEMENT FOR MINIMIZING SEDIMENT,
W71-06432 05G

AMIR, J.
THE INFLUENCE OF VARIOUS SOIL MOISTURE-REGIMES ON THE YIELD AND QUALITY OF COTTON IN AN ARID ZONE,
W71-06217 03F

ANDERSON, RICHARD T.
GOVERNMENTAL RESPONSIBILITY FOR WASTE MANAGEMENT IN URBAN REGIONS,
W71-06282 05G

ANDERSON, T. A.
MAIN DRAINAGE,
W71-06422 08A

APIDIANAKIS, J.
LIQUID WASTE EFFLUENTS FROM A NUCLEAR FUEL REPROCESSING PLANT,
W71-06269 05B

ARMSTRONG-WRIGHT, A. T.
COMPUTERS IN HONG KONG PUBLIC WORKS,
W71-06423 05G

ARMSTRONG, D. E.
EFFECTS OF AGRICULTURAL POLLUTION ON EUTROPHICATION,
W71-06443 05C

ARMSTRONG, ELLIS L.
THE BUREAU OF RECLAMATION'S ROLE IN AMERICA'S GROWTH,
W71-06308 06E

ARROW, KENNETH J.
THE ORGANIZATION OF ECONOMIC ACTIVITY ISSUES PERTINENT TO THE CHOICE OF MARKET VERSUS NONMARKET ALLOCATION,
W71-05966 06C

AUERBACH, R. H.
GRAND COULE THIRD POWERPLANT NOISE CONTROL STUDY,
W71-06329 08C

AUSTIN, LLOYD H.
HYDROLOGIC INVENTORY OF THE UTAH LAKE DRAINAGE AREA,
W71-06218 02E

HYDROLOGIC INVENTORY OF THE UINTAH STUDY UNIT,
W71-06219 02E

BACON, EDMOND J., JR.
TEMPERATURE SELECTION AND HEAT RESISTANCE OF THE MOSQUITO FISH, GAMBUSIA AFFINIS,
W71-06180 05C

BADGER, DANIEL E.
IMPLICATIONS OF WATER QUALITY LAWS FOR THE FEEDLOT INDUSTRY,
W71-06222 05G

BAE, KYUNG MAN
SANITARY CONTROL OF SHELLFISH IN KOREA,
W71-06110 02L

BAHNICK, DONALD
REPORT ON BIOLOGICAL, CHEMICAL, AND GEOLOGICAL STUDIES OF BOIS BRULE AND POPLAR RIVER WATERSHEDS,
W71-05986 05C

BAKER, CHARLES T.
ION-SELECTIVE ELECTROCHEMICAL SENSORS,
W71-06239 03A

ION-SELECTIVE ELECTROCHEMICAL SENSORS - SECOND REPORT,
W71-06240 03A

BAKER, C. H., JR.
WATER RESOURCES OF THE HEBER-KAMAS-PARK CITY AREA, NORTH-CENTRAL UTAH,
W71-05852 02E

BALLINGER, D. G.
CHEMICAL CHARACTERIZATION OF BOTTOM SEDIMENTS,
W71-05981 05A

CHARACTERIZATION OF OIL SLICKS ON SURFACE WATERS,
W71-06261 05A

BARBARO, R. D.
THE EFFECT OF CLAY MINERALS ON SURFACTANT BIODEGRADABILITY,
W71-06196 05D

BARDEN, L.
ENGINEERING BEHAVIOR AND STRUCTURE OF COMPACTED CLAY,
W71-05908 08D

BARNES, H. C.
INITIAL EXPERIENCES ON THE 765 KV SYSTEM OF THE AMERICAN ELECTRIC POWER COMPANY (USA),
W71-05913 08C

BARNETT, M. A.
THE ECOLOGY AND OCEANOGRAPHY OF SEWER OUTFALLS,
W71-05928 06G

BARSCH, RAYMOND E.
THE DEVELOPMENT AND APPLICATION OF A HYDROLOGIC MODEL AS AN OPERATIONAL TOOL,
W71-06135 02C

BATZ, GARY C.
DEVELOPMENT OF NEUTRON ACTIVATION FOR INVESTIGATION OF WATER CLARIFICATION,
W71-06265 05D

BAUMANN, ROBERT E.
EFFECTS OF SURFACE RUNOFF ON THE FEASIBILITY OF MUNICIPAL ADVANCED WASTE TREATMENT,
W71-06445 05D

BAXTER, J. K.
INCREASING SEWAGE FLOW VELOCITY BY USING CHEMICAL ADDITIVES,
W71-06400 08B

BAYLEY, H. S.
NITROGEN AND AMINO ACIDS IN THE FECES OF YOUNG PIGS RECEIVING A PROTEIN-FREE DIET AND DIETS CONTAINING GRADED LEVELS OF SOYBEAN OIL MEAL OR CASEIN,
W71-06451 05B

BEARD, J. T.
AN INTERFEROMETRIC TECHNIQUE FOR TEMPERATURE AND CONCENTRATION MEASUREMENT FOR AN AIR-WATER INTERFACE,
W71-06090 05A

BEER, C. E.
YIELD REDUCTION BY CONTROLLED FLOODING OF CORN,
W71-06152 03F

BEESTON, MICHAEL D.
CRUSTACEANS AND FISHES IN THE SEA GRANT PONDS,
W71-06016 02L

BEKURE, SOLOMON
AN ECONOMIC ANALYSIS OF THE INTERTEMPORAL ALLOCATION OF GROUNDWATER IN THE CENTRAL OGALLALA FORMATION,
W71-06266 04B

BELLER, M.
TREATMENT OF ACID MINE DRAINAGE BY OZONE OXIDATION,
W71-06250 04D

BELL, HENRY L.
EFFECTS ON PH ON THE LIFE CYCLE OF THE MIDGE TANYTARSUS DISSIMILIS,
W71-05982 05C

BENFIELD, C. A. J.
PLASTICS IN WATER AND SEWAGE CONTROL,
W71-06424 08G

BERGHINZ, CARLO
VENICE IS SINKING INTO THE SEA,
W71-06120 02F

BERNARD, HAROLD
ACCOMPLISHMENTS AND GOALS,
W71-06449 05G

BEUSCHER, J. H.
WATER-USE LAW AND ADMINISTRATION IN WISCONSIN,
W71-06192 06E

BHARDWAJ, S. N.
PHYSIOLOGY OF BOLL SHEDDING IN COTTON IV. CORRELATION STUDIES ON FLOWER PRODUCTION AND BOLL SHEDDING IN RELATION TO TEMPERATURE AND RAINFALL,
W71-06056 03F

BIELORAI, H.
THE INFLUENCE OF VARIOUS SOIL MOISTURE-REGIMES ON THE YIELD AND QUALITY OF COTTON IN AN ARID ZONE,
W71-06217 03F

BIRCHFIELD, G. E.
STATISTICAL ANALYSIS OF CURRENTS AT TWO NEAR-BY STATIONS IN LAKE MICHIGAN, SUMMER, 1967,
W71-05893 02H

HORIZONTAL TRANSPORT IN A ROTATING BASIN OF PARABOLIC DEPTH PROFILE,
W71-05903 02E

WIND-DRIVEN CURRENTS IN A LONG ROTATING CHANNEL,
W71-05904 02E

A CASE STUDY OF COASTAL CURRENTS IN LAKE MICHIGAN,
W71-06174 02H

BIRD, A. W.
INFILTRATION IN SEWERS,
W71-06403 08A

BISHOP, A. A.
PROBLEMS OF POLLUTION OF IRRIGATION WATERS IN ARID REGIONS,
W71-06112 05B

BJERKNES, JACOB
PACIFIC OCEAN INFLUENCE UPON CALIFORNIA RAINFALL,
W71-06115 02B

BLACKBURN, THOMAS R.
GEOLOGICAL, CHEMICAL, AND PHYSICAL ATTRIBUTES OF SEDIMENTS IN SENECA LAKE, NEW YORK,
W71-05890 02J

BLACKLAW, J. R.
STUDY OF EQUIPMENT AND METHODS FOR REMOVING OR DISPERSING OIL FROM OPEN WATERS,
W71-06106 05G

BLACK, C. A.
BEHAVIOR OF SOIL AND FERTILIZER PHOSPHORUS IN RELATION TO WATER POLLUTION,
W71-06434 05B

BLASE, MELVIN G.
PUBLIC WATER FOR RURAL AREAS AND SMALL TOWNS,
W71-05973 06D

BLASING, TERENCE J.
MULTIVARIATE TECHNIQUES FOR SPECIFYING TREE-GROWTH AND CLIMATE RELATIONSHIPS AND FOR RECONSTRUCTING ANOMALIES IN PALEOCLIMATE,
W71-05851 02B

BLEWITT, RONALD I.
THE SOCIAL AND ECONOMIC NEED FOR FLOODPLAIN REGULATION,
W71-06131 04A

BLODGOOD, D. E.
TWENTY YEARS OF INDUSTRIAL WASTE TREATMENT,
W71-06037 05D

BOLTER, ERNST A.
POLLUTION FROM MINES IN THE 'NEW LEAD BELT' OF SOUTH EASTERN MISSOURI,
W71-05837 05A

BOND, CARL E.
THE EFFECTS OF THE HERBICIDES DIQUAT AND DICHLOBENIL (CASORON) ON POND INVERTEBRATES PART I. ACUTE TOXICITY,
W71-06181 05C

BONREN, JAMES T.
THE ABSENCE OF KNOWLEDGE OF DISTRIBUTIONAL IMPACTS AN OBSTACLE TO EFFECTIVE POLICY ANALYSIS AND DECISIONS,
W71-05963 06B

BOTTGER, W. O. J.
FREQUENCY OF STORM-SEWAGE OVERFLOWS. THE FREQUENCY OF STORM SEWAGE OVERFLOWS IN COMBINED SEWERAGE SYSTEMS IN CONNECTION WITH STORAGE AND PUMP CAPACITY, CONCLUSIONS FROM THE RAINFALL DATA OF THE KNMI FOR 1926-1962,
W71-06365 05G

BOWER, BLAIR T.
ENVIRONMENTAL QUALITY MANAGEMENT,
W71-05941 06B

BOYSEN, STEPHEN M.
STRUCTURES PREVENT URBAN SEDIMENT DAMAGE,
W71-06425 04D

BRADBURY, J. P.
LIMNOLOGY OF ZUNI SALT LAKE, NEW MEXICO,
W71-05846 02H

BRADLEY, RICHARD A.
SHEARING EFFECTS ON SETTLING OF ACTIVATED SLUDGE,
W71-06029 05D

BRAND, E. W.
DESIGN OF SUB-SURFACE DRAINAGE SYSTEM FOR INNER RING ROAD (CITY OF ANTIWERP,
W71-06391 08B

SOLUTION OF AN UNUSUAL SUBSURFACE DRAINAGE PROBLEM,
W71-06392 08A

BRANSBY, P. L.
EXPERIMENTAL AND THEORETICAL INVESTIGATIONS OF A PASSIVE EARTH PRESSURE PROBLEM,
W71-05919 08D

BREMVER, RAYMOND M.
PLASTIC RELINING OF SMALL-DIAMETER PIPES,
W71-06426 08G

BREWER, R.
WATER REQUIREMENTS FOR MANUFACTURING,
W71-06318 06D

WATER USE BY APPALACHIAN MANUFACTURERS,
W71-06319 06D

BREZONIK, PATRICK L.
EUTROPHICATION CAUSE--EFFECT RELATIONSHIPS,
W71-06009 05C

BRICE, H. D.
A PROPOSED STREAMFLOW-DATA PROGRAM FOR NEBRASKA,
W71-06128 07A

BRISON, JEAN
THE LIFE OF MICROBES IN THE SEA AND THE CURRENT POLLUTION OUTLOOK (IN FRENCH),
W71-06202 05C

BRITT, CLARENCE S.
INTRODUCTION ISSUES IN FOOD PRODUCTION AND CLEAN WATER,
W71-06429 05G

BRITT, N. WILSON
MONTHLY VARIATION IN PHOSPHATE AND RELATED CHEMICALS FOUND IN THE SEDIMENT IN THE ISLAND AREA OF LAKE ERIE, 1967-68, WITH REFERENCE TO SAMPLES COLLECTED IN 1964, 1965, AND 1966
W71-06187 05B

BROEHL, D. J.
FIELD INVESTIGATION OF ENVIRONMENTAL EFFECTS OF COOLING TOWERS FOR LARGE STEAM ELECTRIC PLANTS,
W71-05930 05D

BRONSON, J. C.
TREATMENT OF ORGANIC INDUSTRIAL WASTES BY LAGOONING,
W71-06036 05D

BROOKS, R. W.
SOME ASPECTS OF SEWAGE TREATMENT AT COVENTRY,
W71-06366 05D

BROWN, ELISE A. B.
METABOLISM OF QUINALDINE(2-METHYL-QUINOLINE). UPTAKE AND EXCRETION BY NURSE SHARKS,
W71-06324 05C

BROWN, JOHN WEBSTER
AN APPROACH TO SNOW LOAD EVALUATION,
W71-06142 02C

BROWN, R. G.
WATER USE BY COTTON FROM LOW AND MODERATELY SALINE STATIC WATER TABLES,
W71-06221 03C

BROWN, T. CECIL
INSTALLATION OF SOIL, WASTE AND DRAINAGE PIPING IN FILL OR UNSTABLE SOIL,
W71-06285 08A

BRUHN, H. D.
PHYSICAL PROPERTIES AND PROCESSING CHARACTERISTICS OF MACROPHYTES AS RELATED TO MECHANICAL HARVESTING,
W71-06188 04A

BRYDGES, T. G.
INVESTIGATIONS OF DAILY VARIATIONS IN CHEMICAL BACTERIOLOGICAL AND BIOLOGICAL PARAMETERS AT TWO LAKE ONTARIO LOCATIONS NEAR TORONTO, PART I--CHEMISTRY,
W71-05879 05A

BUECHI, PETER J.
WIND INDUCED CIRCULATION PATTERN IN A ROTATING MODEL OF LAK ERIE,
W71-05891 02H

BURCHFIELD, HARRY P.
METHANOL REQUIREMENT AND TEMPERATURE EFFECTS IN WASTE WATER DENITRIFICATION,
W71-06246 05D

BURGESS, FRED J.
AERIAL PHOTOGRAPHIC TRACING OF PULP MILL EFFLUENT IN MARINE WATERS,
W71-06258 05B

BURTON, DENNIS T.
LACTIC AND PYRUVIC ACID CHANGES IN BLUEGILL SUNFISH (LEPOMIS MACROCHIRUS RAFINESQUE) DURING GRADUAL HYPOXIA AT TWO ACCLIMATION TEMPERATURES (5 AND 20C),
W71-06320 05C

BUSH, RICHARD H.
THE DEVELOPMENT AND APPLICATION OF A HYDROLOGIC MODEL AS AN OPERATIONAL TOOL,
W71-06135 02C

BUXTON, D. R.
ESTABLISHMENT OF PERENNIAL FORAGES I. SUBSEQUENT YIELDS II. SUBSEQUENT ROOT DEVELOPMENT,
W71-06215 03F

CAGLE, J. W.
AVAILABILITY OF GROUNDWATER IN DECATUR COUNTY, IOWA,
W71-06175 02F

CAIRNS, JOHN, JR.
EFFECTS OF ALKYL BENZENE SULFONATE ON BREEDING BEHAVIOR OF FLAGFISHES, JORDANELLA FLORIDAE,
W71-06184 05C

CAIRNS, J., JR.
BIOLOGICAL CONCEPTS AND INDUSTRIAL WASTE DISPOSAL PROBLEMS,
W71-06038 05D

CALDWELL, RICHARD S.
THE INFLUENCE OF ACCLIMATION TEMPERATURE ON THE LIPID COMPOSITION OF FISH GILL MITOCHONDRIA,
W71-06321 05C

CALECA, V.
INITIAL EXPERIENCES ON THE 765 KV SYSTEM OF THE AMERICAN ELECTRIC POWER COMPANY (USA),
W71-05913 08C

CALVERT, JOHN T.
STORM OVERFLOWS AND STORM SEWAGE,
W71-06367 05G

CAMPBELL, ROBERT S.
EFFECTS OF AGRICULTURAL POLLUTANTS ON RECREATIONAL USES OF SURFACE WATERS,
W71-06444 05C

CARLSON, KATHLEEN H.
NITROGEN AND AMINO ACIDS IN THE FECES OF YOUNG PIGS RECEIVING A PROTEIN-FREE DIET AND DIETS CONTAINING GRADED LEVELS OF SOYBEAN OIL MEAL OR CASEIN,
W71-06451 05B

CARPENTER, T. G.
DEPTH OF FLOW AS DESIGN CRITERION FOR CHANNELS WITH ARTIFICIAL LINERS,
W71-06399 08B

CAVE, G. M.
PLASTICS IN WATER AND SEWAGE CONTROL,
W71-06286 08G

CAYOT, R. F.
THERMAL DISCHARGE A MODEL - PROTOTYPE COMPARISON,
W71-06095 05B

CHAPMAN, D. G.
ACTIVITIES OF THE FOOD AND AGRICULTURE ORGANIZATION AND THE WORLD HEALTH ORGANIZATION REGARDING MERCURY,
W71-06079 05A

CHAPPELL, C. F.
THE SURFACE INSTRUMENT NETWORK OF THE UPPER COLORADO RIVER PILOT PROJECT,
W71-06136 07A

CHAUDHRY, M. H.
RESONANCE IN PRESSURIZED PIPING SYSTEMS,
W71-05905 08B

CHAU, Y. K.
TRACE ELEMENTS IN LAKE ERIE,
W71-05880 05A

CHAWLA, V. K.
TRACE ELEMENTS IN LAKE ERIE,
W71-05880 05A

DISSOLVED MINERAL QUALITY OF GREAT LAKES WATERS,
W71-05883 05A

CHEN, C. S.
AN INTERFEROMETRIC TECHNIQUE FOR TEMPERATURE AND CONCENTRATION MEASUREMENT FOR AN AIR-WATER INTERFACE,
W71-06090 05A

CHESTNUT, A. F.
STUDIES OF MARINE ESTUARINE ECOSYSTEMS DEVELOPING WITH TREATED SEWAGE WASTES,
W71-06012 02L

MOLLUSCAN STUDIES,
W71-06015 02L

CHIANG, SIE LING
A CRAZY IDEA ON URBAN WATER MANAGEMENT,
W71-06309 06B

CHOU, DAVID CHUNG-SHUNG
ONE-DIMENSIONAL OPEN CHANNEL HEAT DISPERSION,
W71-06085 05G

CHOW, VEN TE
A PROGRAMMING MODEL FOR FARM IRRIGATION SYSTEMS,
W71-05923 03F

CHOW, V. T.
WATER RESOURCES SYSTEMS ANALYSIS OF DISCRETE DIFFERENTIAL DYNAMIC PROGRAMMING,
W71-05922 06A

CIHACEK, LARRY J.
INFRARED PHOTOS CAN MAP SOILS,
W71-06058 07B

CLAASSEN, HANS C.
RADIOCHEMICAL ANALYSES OF WATER FROM SELECTED STREAMS, WELLS, SPRINGS, AND PRECIPITATION COLLECTED PRIOR TO REENTRY DRILLING, PROJECT RULISON,
W71-05842 05A

CLADE, J.
A STUDY OF THE DESIGN PARAMETERS OF UHV LINES,
W71-05914 08C

CLARKSON, JAMES D.
ECOLOGY AND SPATIAL ANALYSIS,
W71-06317 06F

CLARKSON, T. W.
THE ABSORPTION OF MERCURY FROM FOOD, ITS SIGNIFICANCE AND NEW METHODS OF REMOVING MERCURY FROM THE BODY,
W71-06080 05C

CLARK, MARY E.
MARINE WASTE DISPOSAL AND SEA URCHIN ECOLOGY,
W71-06262 05C

CLARK, R. N.
DEPTH OF FLOW AS DESIGN CRITERION FOR CHANNELS WITH ARTIFICIAL LINERS,
W71-06399 08B

CLEGG, DAVID J.
EMBRYOTOXICITY OF MERCURY COMPOUNDS,
W71-06081 05C

COLEMAN, JAMES M.
SEDIMENTATION IN A MALAYSIAN HIGH TIDE TROPICAL DELTA,
W71-05858 02J

COLE, ALAN L.
WAVE FORCES IN LAKE ERIE,
W71-05894 02H

CONTINI, BRUNO
A CRITICAL SURVEY OF USE OF COST-BENEFIT ANALYSIS IN PUBLIC FINANCE,
W71-05948 06C

CONVERSE, J. C.
OXIDATION DITCH TREATMENT OF SWINE WASTES, SUMMARY REPORT,
W71-06442 05D

COOPER, R. C.
TREATMENT OF ORGANIC INDUSTRIAL WASTES BY LAGOONING,
W71-06036 05D

COULOMBE, HARRY N.
THE ROLE OF SUCCULENT HALOPHYTES IN THE WATER BALANCE OF SALT MARSH RODENTS,
W71-06073 02I

COULSON, C. H.
SNOW COURSE WEIGHTING PROCEDURE,
W71-06146 07C

CRAWFORD, H. R.
INCREASING SEWAGE FLOW VELOCITY BY USING CHEMICAL ADDITIVES,
W71-06400 08B

CROSS, O. E.
ANAEROBIC DECOMPOSITION OF SWINE EXCREMENT,
W71-06453 05D

CROW, L. W.
THE SURFACE INSTRUMENT NETWORK OF THE UPPER COLORADO RIVER PILOT PROJECT,
W71-06136 07A

CULLER, RICHARD C.
WATER CONSERVATION BY REMOVAL OF PHREATOPHYTES,
W71-06154 03B

CUNNINGHAM, G. L.
VARIATIONS IN WATER STRESS IN ONE-YEAR-OLD NEEDLES OF A PONDEROSA PINE,
W71-06057 02I

CURRAN, TERENCE P.
WATER RESOURCES MANAGEMENT IN THE PUBLIC INTEREST,
W71-06314 06B

CURTIS, LAMONT W.
STORM WATER TREATMENT AT CLEVELAND,
W71-06389 05D

VELOCITY MEASUREMENTS IN SEWERS VITAL TO DESIGN AND MAINTENANCE,
W71-06394 08B

CVANCARA, ALAN M.
MUSSELS (UNIONIDAE) OF THE RED RIVER VALLEY IN NORTH DAKOTA AND MINNESOTA, USA,
W71-06001 05C

DABINI, OLIVA
POSSIBILITY OF STUDYING THE EFFECTS OF POLLUTION ON BENTHIC ORGANISMS EMPLOYING IMMERSED PANELS (IN FRENCH),
W71-06205 05C

DAHM, PAUL A.
CHEMISTRY AND METABOLISM OF INSECTICIDES,
W71-06438 05C

DANIEL, S.
STUDY OF THE INFLUENCE OF BDELLORIBRIO BACTERIOROUS IN MARINE SELF-PURIFICATION (IN FRENCH),
W71-06204 05C

DAVIDSON, DANIEL R.
A CASE STUDY OF COASTAL CURRENTS IN LAKE MICHIGAN,
W71-06174 02H

DAVIDSON, DONALD
REPORT ON BIOLOGICAL, CHEMICAL, AND GEOLOGICAL STUDIES OF BOIS BRULE AND POPLAR RIVER WATERSHEDS,
W71-05986 05C

DAVIDSON, DONALD W.
THE UPLAND FOREST VEGETATION OF THE BOIS BRULE RIVER BASIN, TRIBUTARY TO LAKE SUPERIOR,
W71-05987 02J

DAVIDSON, J. M.
DEGRADATION OF WATER QUALITY IN IRRIGATION RETURN FLOWS,
W71-06063 03F

DAVIS, HERBERT L., III.
THE NET EXCHANGES OF PHOSPHORUS BY ESTUARINE SEDIMENTS IN FLOWING WATERS,
W71-06010 02J

DAVIS, OTTO
EXTERNALITIES, INFORMATION AND ALTERNATIVE COLLECTIVE ACTION,
W71-05964 06B

DAVIS, R. E.
THE ECOLOGY AND OCEANOGRAPHY OF SEWER OUTFALLS,
W71-05928 06G

DAWES, JULIUS H.
NITRATE POLLUTION OF WATER,
W71-06130 05B

DAY, D. L.
OXIDATION DITCH TREATMENT OF SWINE WASTES, SUMMARY REPORT,
W71-06442 05D

DAY, JOHN
CARBON,
W71-06017 02L

DE ROSE, CHARLES R.
THE MONOCACY RIVER-PHYSICAL, CHEMICAL AND BACTERIOLOGICAL WATER QUALITY REPORT NUMBER 1, MARCH-DECEMBER 1966,
W71-06176 05B

DEAN, ROBERT B.
ULTIMATE DISPOSAL OF INDUSTRIAL WASTE AN OVERVIEW,
W71-06259 05E

DEBRAAL, J. PETER
WATER-USE LAW AND ADMINISTRATION IN WISCONSIN,
W71-06192 06E

DELAUNE, R. D.
UREA CONVERSION TO AMMONIA IN WATERLOGGED SOILS,
W71-05866 02K

DEMINT, R. J.
HERBICIDE RESIDUES IN AGRICULTURAL WATER FROM CONTROL OF AQUATIC AND BANK WEEDS,
W71-06440 05B

DEWINTER, DIRK M.
RESEARCH ON PIEZODIALYSIS - SECOND REPORT,
W71-06236 03A

DHCLAKIA, SHIRISH G.
METHANOL REQUIREMENT AND TEMPERATURE EFFECTS IN WASTE WATER DENITRIFICATION,
W71-06246 05D

DICKAS, ALBERT
REPORT ON BIOLOGICAL, CHEMICAL, AND GEOLOGICAL STUDIES OF BOIS BRULE AND POPLAR RIVER WATERSHEDS,
W71-05986 05C

DICKSON, LEAL G.
ENVIRONMENTALLY-INDUCED CHANGES IN THE FATTY ACIDS OF CHLORELLA,
W71-05992 02I

DILLON, RONALD
BENTHIC PRODUCTIVITY,
W71-06020 02L

DIMCHEV, T.
DETERMINATION OF FLOOD FLOWS AND DISCHARGE COEFFICIENTS IN MUNICIPAL SEWERAGE SYSTEMS,
W71-06395 08B

DIXON, NEAL
GRAPHIC DISSOLVED OXYGEN COMPUTATION,
W71-06121 01A

DOBINSON, K. W.
DRAINAGE OF WIDE ROAD PAVEMENTS,
W71-06368 08A

DONNELY, WILLIAM
SCAPER PRODUCTION SPEEDS PIPE TRENCHING AT LOWER COSTS,
W71-06287 08C

DORFMAN, ROBERT
A MODEL OF PUBLIC DECISIONS ILLUSTRATED BY A WATER POLLUTIO POLICY PROBLEM,
W71-05939 06A

DOSS, B. D.
EFFECT OF IRRIGATION ON RECOVERY OF APPLIED NITROGEN BY COTTON,
W71-06216 03F

DOUDOROFF, PETER
DISSOLVED OXYGEN CRITERIA FOR THE PROTECTION OF FISH,
W71-06182 05C

DOUGLASS, JOHN R.
DEFORMATION OF LEE-SIDE LAMINAE IN EOLIAN DUNES,
W71-05845 02J

DOWDY, R. H.
CHEMISTRY OF SEDIMENT IN WATER,
W71-06431 05B

DOWNEY, JOE S.
GROUNDWATER RESOURCES OF NELSON COUNTY, NORTHEASTERN NORTH DAKOTA,
W71-06160 07C

DOYLE, EDWARD C.
PERIPHYTON ACCRUAL IN THE KASKASKIA RIVER AND ADJACENT FLOODPLAIN POOLS IN EAST-CENTRAL ILLINOIS,
W71-06011 02I

DRESCHSEL, A.
A GUIDE FOR CONTRACTORS ON THE CONSTRUCTION OF DRAINAGE SYSTEMS,
W71-06288 08A

DREW, JAMES V.
INFRARED PHOTOS CAN MAP SOILS,
W71-06058 07B

DROWN, DAVID B.
THE USE OF CONCENTRATIONS OF ELECTROLYTES AND NATURALLY FLUORESCENT MATERIALS TO STUDY WATER MASS MOVEMENTS IN A FRESHWATER 'ESTUARY',
W71-05877 02L

DRUMMOND, R. A.
AN ELECTRODE CHAMBER FOR RECORDING RESPIRATORY AND OTHER MOVEMENTS OF FREE-SWIMMING ANIMALS,
W71-06328 05A

DUBLETON, BRUCE
ANGLESEY ALUMINUM SEA OUTFALL,
W71-06289 08A

DUBS, L. C.
MORE THAN JUST A BUILDING,
W71-06369 08A

DUCKSTEIN, LUCIEN
OPERATIONS RESEARCH STUDY OF WATER RESOURCES - PART II,
W71-06307 06A

DUFFER, WILLIAM R.
INDUCED HYPOLIMNION AERATION FOR WATER QUALITY IMPROVEMENT OF POWER RELEASES,
W71-06251 05G

DUFFY, E. R.
APPLICATION OF IRON-ALUMINUM BASE ALLOYS TO SALINE WATER CONVERSION,
W71-06235 08G

DUGAN, PATRICK R.
ALDRIN REMOVAL FROM LAKE WATER BY FLOCCULENT BACTERIA,
W71-06000 05G

DURAN, ALVARO
ANAEROBIC DECOMPOSITION OF SWINE EXCREMENT,
W71-06453 05D

DYCK, G. E.
DENSITIES OF PRAIRIE SNOWPACKS,
W71-06137 02C

EBERHART, JONATHAN
RUBBER TANKS AID SEWAGE FIGHT,
W71-06290 05G

ECKHOFF, D. W.
CHARACTERIZATION AND CONTROL OF COMBINED SEWER OVERFLOWS, SAN FRANCISCO,
W71-06326 08B

EDWARDS, W. F.
PESTICIDE RESIDUES AND ENVIRONMENTAL ECONOMICS,

W71-05951 05G

ELLIOTT, G. H.
SMALL-SCALE MODEL OF THE 'THERMAL BAR',
W71-05895 02H

ELLIOTT, J. A.
SMALL-SCALE MODEL OF THE 'THERMAL BAR',
W71-05895 02H

ELLIS, HAROLD H.
WATER-USE LAW AND ADMINISTRATION IN WISCONSIN,
W71-06192 06E

EMDE, WILHELM V.D.
OVERFLOW STUDIES AT A SEWER SYSTEM OF A METROPOLITAN CITY,
W71-06373 08B

EMMONS, ROBERT
LOW COST STORM DRAINAGE WITH PAVED CHANNELS,
W71-06413 08F

ENGLE, J. B.
SANITARY CONTROL OF SHELLFISH IN KOREA,
W71-06110 02L

ERICKSON, L. E.
WATER QUALITY MODELING AND PREDICTION,
W71-06186 05G

ESCRITT, L. S.
A RE-EXAMINATION OF THE STORM TANK PROBLEM,
W71-06377 05D

EVANS, G. E.
DISCUSSION OF THE USES OF ELECTRONIC PLOTTING IN GROUNDWATER ENGINEERING,
W71-05906 07C

FALLER, ALAN J.
THE GENERATION OF LANGMUIR CIRCULATIONS BY THE EDDY PRESSURE OF SURFACE WAVES,
W71-05871 02H

FAN, L. T.
WATER QUALITY MODELING AND PREDICTION,
W71-06186 05G

FAUST, E.
GLASS FIBER-REINFORCED PLASTICS PIPES FOR WATER PIPELINES,
W71-06291 08G

FENSTER, W. E.
FERTILIZER MANAGEMENT FOR POLLUTION CONTROL,
W71-06437 05G

FERRETTI, L.
POSSIBILITY OF STUDYING THE EFFECTS OF POLLUTION ON BENTHIC ORGANISMS EMPLOYING IMMERSED PANELS (IN FRENCH),
W71-06205 05C

FIERING, MYRON B.
STREAMFLOW SYNTHESIS,
W71-05946 04A

FIMREITE, NORVALD
MERCURY USES IN CANADA AND THEIR POSSIBLE HAZARDS AS SOURCES OF MERCURY CONTAMINATION,
W71-05861 05B

FINSTEIN, M. S.
FILAMENTOUS MICROORGANISMS AND THE BULKING OF ACTIVATED SLUDGE,
W71-06028 05D

FINSTER, RONALD D.
IMPROVING WATER RESOURCE ALLOCATION THROUGH DEMAND-ORIENTED WATER POLICY,
W71-06316 06B

FISCHER, JAMES R.
INVESTIGATION OF MEANS FOR CONTROLLED SELF-DESTRUCTION OF PESTICIDES,
W71-06249 05G

FISHER, W. H.
SNOW AND RESERVOIR MANAGEMENT IN CANADA FOR THE COLUMBIA RIVER TREATY OPERATION,
W71-06134 02C

FITZGERALD, GEORGE P.
ALGICIDES,
W71-06189 05C

FLEMER, D. A.
POWER PLANTS EFFECTS OF CHLORINATION ON ESTUARINE PRIMARY PRODUCTION,
W71-06097 05C

FLOWERDAY, A. D.
HOW TO SELECT AND APPLY ZINC FERTILIZER,
W71-06059 03F

FORWARD, CHARLES N.
WATERFRONT LAND USE IN THE AUSTRALIAN STATE CAPITALS,
W71-06065 06B

FOSTER, J. A.
SEWERS UNDER ATTACK,
W71-06301 08G

FOSTER, NEAL R.
EFFECTS OF ALKYL BENZENE SULFONATE ON BREEDING BEHAVIOR OF FLAGFISHES, JORDANELLA FLORIDAE,
W71-06184 05C

FRANK, P. A.
HERBICIDE RESIDUES IN AGRICULTURAL WATER FROM CONTROL OF AQUATIC AND BANK WEEDS,
W71-06440 05B

FREA, JAMES I.
ALDRIN REMOVAL FROM LAKE WATER BY FLOCCULENT BACTERIA,
W71-06000 05G

FREEMAN, A. MYRICK
WATER POLLUTION CONTROL, RIVER BASIN AUTHORITIES AND ECONOMIC INCENTIVES SOME CURRENT POLICY ISSUES,
W71-05937 06B

FREEMAN, A. MYRICK, III.
PROJECT DESIGN AND EVALUATION WITH MULTIPLE OBJECTIVES,
W71-05962 06B

FREEMAN, TED G.
SNOW SURVEY TELEMETRY NETWORKS AND FUTURE PLANS,
W71-06148 07A

FREMLING, CALVIN R.
MAYFLY DISTRIBUTION AS A WATER QUALITY INDEX,
W71-06248 05A

FRIEDLAND, A. O.
CHARACTERIZATION AND CONTROL OF COMBINED SEWER OVERFLOWS, SAN FRANCISCO,
W71-06326 08B

FRITSCHI, E. W.
BUILDING DRAINAGE PUMP STATIONS WITHIN LIMITED BUDGET,
W71-06378 08C

FRITTS, HAROLD C.
MULTIVARIATE TECHNIQUES FOR SPECIFYING TREE-GROWTH AND CLIMATE RELATIONSHIPS AND FOR RECONSTRUCTING ANOMALIES IN PALEOCLIMATE,
W71-05851 02B

FRITTS, H. C.
VARIATIONS IN WATER STRESS IN ONE-YEAR-OLD NEEDLES OF A PONDEROSA PINE,
W71-06057 02I

FRUH, E. G.
SELECTIVE WITHDRAWAL AT LAKE LIVINGSTON, PRELIMINARY EVALUATIONS, 1969,
W71-06193 05C

GAGLIANO, SHERWOOD M.
SEDIMENTATION IN A MALAYSIAN HIGH TIDE TROPICAL DELTA,
W71-05858 02J

GALLIERS, R.
DEVELOPMENTS IN SEWER MONITORING EQUIPMENT AND TECHNIQUES,
W71-06428 08B

GALLOWAY, RAYMOND A.
ENVIRONMENTALLY-INDUCED CHANGES IN THE FATTY ACIDS OF CHLORELLA,
W71-05992 02I

GALLUP, W. J.
STABILIZED BASE FOR RESIDENTIAL STREETS,
W71-06292 08F

GALYAMIN, YE. P.
FORMATION OF THE THERMAL REGIME IN SOILS ON IRRIGATED FIELDS IN PERMAFROST REGIONS,
W71-06070 02G

GARG, SATYA P.
EFFICIENCY OF HYDRAULIC JUMP,
W71-05850 08B

GARTON, JAMES E.
THE MECHANISM OF DIRECT RUNOFF FROM RAINFALL,
W71-06264 02G

GAUDY, A. F., JR.
SOME EFFECTS OF HIGH SALT CONCENTRATIONS ON ACTIVATED SLUDGE,
W71-06034 05D

GAUTHIER, M.
ANTIBACTERIAL SUBSTANCES PRODUCED BY MARINE BACTERIA (IN FRENCH),
W71-06203 05C

ANTIBACTERIAL ACTIVITY OF A MARINE DIATOM ASTERIONELLA NOTATA (GRUN) (IN FRENCH),
W71-06211 05C

GEIGER, W.
TEMPERATURE CONTROL IN OUTDOOR EXPERIMENTAL PONDS,
W71-06093 05C

GENETELLI, E. J.
PRELIMINARY PROCESS DESIGN AND TREATABILITY STUDIES OF FISH PROCESSING WASTES,
W71-06035 05D

GEORGE, D. R.
RECOVERY OF URANIUM FROM NATURAL MINE WATERS BY

COUNTERCURRENT ION EXCHANGE,
W71-05841 05D

GEORGE, TOMMY A.
THE DESCHUTES RIVER HYDROGRAPH FORECAST,
W71-06144 04A

GIBBS, CHARLES V.
STEPS TO SUCCESS IN WATER POLLUTION CONTROL,
W71-06379 05G

GIESKES, JORIS M.
EFFECT OF TEMPERATURE ON THE PH OF SEAWATER,
W71-06167 02K

GIGGER, R. P., JR.
TREATMENT OF FISH HATCHERY EFFLUENT FOR RECYCLE,
W71-06024 05D

GINSBURG, H.
RADIAL WATER AND SOLUTE FLOWS IN ROOTS OF ZEA MAYS I. WATER FLOW,
W71-06064 02I

GINZBURG, B. Z.
RADIAL WATER AND SOLUTE FLOWS IN ROOTS OF ZEA MAYS I. WATER FLOW,
W71-06064 02I

GLAESER, JOHN L.
A STUDY OF THE BEHAVIOR OF OIL SPILLS IN THE ARCTIC,
W71-06101 05B

GLANCY, PATRICK A.
WATER-RESOURCES APPRAISAL OF THE COLUMBUS SALT MARSH-SODA SPRING VALLEY AREA, MINERAL AND ESMERALDA COUNTIES, NEVADA,
W71-05862 04B

GLCYNA, E. F.
PROCESS MODELING OF BIOLOGICAL WASTE TREATMENT,
W71-06026 05D

GOLDBERG, MARVIN C.
SOURCES OF NITROGEN IN WATER SUPPLIES,
W71-06435 05B

GRAFE, VOLKER
DEVELOPMENT OF AN INSTRUMENT FOR MEASURING THE CONCENTRATION OF DISSOLVED OXYGEN IN SEA WATER IN SITU,
W71-06104 05A

GRANT, E. M.
'KEROSENE' TAINT IN SEA MULLET (MUGIL CEPHALUS LINNAEUS),
W71-06185 05C

GRANT, LEWIS C.
OPPORTUNITIES FOR MODIFYING WEATHER TO AUGMENT PRECIPITATION AND SUPPRESS HAIL,
W71-06132 03B

GRAVA, SIGURD
URBAN PLANNING ASPECTS OF WATER POLLUTION CONTROL,
W71-05944 06B

GRAY, CARLETON H.
THE AUTOMATIC HYDROLOGICAL RADIO REPORTING NETWORK, NEW ENGLAND DIVISION, CORPS OF ENGINEERS,
W71-06149 07A

GRAY, DON M.
DENSITIES OF PRAIRIE SNOWPACKS,
W71-06137 02C

GRIBBON, E.
SOME ASPECTS OF BIOLOGY OF CARCINUS MAENAS (L) II SURVIVAL AT LOW SALINITY,
W71-06179 05C

GRIEVES, R. B.
PROCESS OPTIMA IN ACTIVATED SLUDGE,
W71-06032 05D

FOAM SEPARATION PROCESSES FROM INDUSTRIAL WASTE TREATMENT PHENOL, PHOSPHATE, AND HEXAVALENT CHROMIUM,
W71-06194 05D

GRINER, LYNN A.
EFFECTS OF OIL POLLUTION ON WATERFOWL A STUDY OF SALVAGE METHODS,
W71-05983 05C

HAIMES, YACOV Y.
MODELING AND CONTROL OF THE POLLUTION OF WATER RESOURCES SYSTEMS VIA MULTILEVEL APPROACH,
W71-06311 06A

HALE, ALAN M.
INTERNAL WAVES OF THE SECOND VERTICAL MODE IN LAKE HURON,
W71-05896 02H

HALL, CHARLES
FIRST YEAR RECORD OF TOTAL METABOLISM OF MARINE PONDS RECEIVING TREATED WASTES,
W71-06023 02L

HALL, CHARLES A. S.
DIURNAL CHANGES IN STRATIFICATION AND DISSOLVED OXYGEN IN THE SURFACE WATERS OF LAKE MICHIGAN,
W71-05900 02H

HAMBLIN, P. F.
HYDRAULIC AND WIND-INDUCED CIRCULATION IN A MODEL OF A GREAT LAKE,
W71-05897 02H

HAMILTON, D. H., JR.
POWER PLANTS EFFECTS OF CHLORINATION ON ESTUARINE PRIMARY PRODUCTION,
W71-06097 05C

HAMMERSTROM, E. J.
SANITARY CONTROL OF SHELLFISH IN KOREA,
W71-06110 02L

HANDA, B. K.
EVALUATION OF SOME STABILIZATION PONDS IN INDIA,
W71-06033 05D

HANDLER, ANTHONY R.
POLLUTION FROM MINES IN THE 'NEW LEAD BELT' OF SOUTH EASTERN MISSOURI,
W71-05837 05A

HANNAFORD, JACK F.
THE DEVELOPMENT AND APPLICATION OF A HYDROLOGIC MODEL AS AN OPERATIONAL TOOL,
W71-06135 02C

HANSEN, E. L.
OXIDATION DITCH TREATMENT OF SWINE WASTES, SUMMARY REPORT,
W71-06442 05D

HANSON, ARNE
MAN-MADE SOURCES OF MERCURY,
W71-06077 05B

HANSON, L. D.
FERTILIZER MANAGEMENT FOR POLLUTION CONTROL,
W71-06437 05G

HARGIS, DAVID R.
ARTIFICIAL RECHARGE PRACTICES IN HAWAII,
W71-06263 04B

HARLIN, CURTIS C., JR.
INDUCED HYPOLIMNION AERATION FOR WATER QUALITY IMPROVEMENT OF POWER RELEASES,
W71-06251 05G

HARMESON, ROBERT H.
NITRATE POLLUTION OF WATER,
W71-06130 05B

HARRINGTON, R.
CONTROL OF INFILTRATION IN SEWER SYSTEMS-DESIGN AND MAINTENANCE,
W71-06197 05D

HARRIOTT, B. L.
SEED TABLETS FOR PRECISION PLANTING LETTUCE,
W71-06224 03F

HASSLER, T. J.
EFFECTS OF ALKYL BENZENE SULFONATE ON RAINBOW TROUT,
W71-06325 05C

HASTINGS, C. R.
THE LE ACOUSTIC FLOWMETER - AN APPLICATION TO DISCHARGE MEASUREMENT,
W71-06293 08B

HAUGH, HAROLD H.
REHABILITATION OF A CONCERT SEWER UNDER INFILTRATION PRESSURE,
W71-06294 08F

HAVEMAN, ROBERT H.
WATER POLLUTION CONTROL, RIVER BASIN AUTHORITIES AND ECONOMIC INCENTIVES SOME CURRENT POLICY ISSUES,
W71-05937 06B

HAWS, FRANK W.
WATER RELATED LAND USE IN THE BEAR RIVER DRAINAGE AREA,
W71-06212 07C

WATER RELATED LAND USE IN THE UTAH LAKE DRAINAGE AREA,
W71-06213 07C

HYDROLOGIC INVENTORY OF THE UTAH LAKE DRAINAGE AREA,
W71-06218 02E

HYDROLOGIC INVENTORY OF THE WEBER RIVER STUDY UNIT,
W71-06220 02E

HAYDEN, BRUCE P.
MULTIVARIATE TECHNIQUES FOR SPECIFYING TREE-GROWTH AND CLIMATE RELATIONSHIPS AND FOR RECONSTRUCTING ANOMALIES IN PALEOCLIMATE,
W71-05851 02B

HEADLEY, J. C.
PESTICIDE RESIDUES AND ENVIRONMENTAL ECONOMICS,
W71-05951 05G

HEIDARI, M.
WATER RESOURCES SYSTEMS ANALYSIS OF DISCRETE DIFFERENTIAL DYNAMIC PROGRAMMING,
W71-05922 06A

HEMPHILL, LOUIS
DEVELOPMENT OF NEUTRON ACTIVATION FOR INVESTIGATION OF WATER CLARIFICATION,

W71-06265 05D

HENAGER, C. H.
STUDY OF EQUIPMENT AND METHODS FOR REMOVING OR DISPERSING OIL FROM OPEN WATERS,
W71-06106 05G

HENDRICKS, T. J.
BOUNDARY LAYER FLOW PROBLEMS IN DESALINATION BY REVERSE OSMOSIS,
W71-06237 03A

HENSON, E. B.
LAKE CHAMPLAIN IN RELATION TO REGIONAL WATER SUPPLY,
W71-05875 03B

HERDMAN, ROBERT
EFFECTS OF OIL POLLUTION ON WATERFOWL A STUDY OF SALVAGE METHODS,
W71-05983 05C

HERIK, A. G. V.D.
FREQUENCY OF STORM-SEWAGE OVERFLOWS. THE FREQUENCY OF STORM SEWAGE OVERFLOWS IN COMBINED SEWERAGE SYSTEMS IN CONNECTION WITH STORAGE AND PUMP CAPACITY, CONCLUSIONS FROM THE RAINFALL DATA OF THE KNMI FOR 1926-1962,
W71-06365 05G

HERR, GLENN H.
AGRICULTURE WASTE RESEARCH NEEDS,
W71-06452 05D

HEUKELEKIAN, H.
FILAMENTOUS MICROORGANISMS AND THE BULKING OF ACTIVATED SLUDGE,
W71-06028 05D

HIMMELBLAU, D. M.
PROCESS MODELING OF BIOLOGICAL WASTE TREATMENT,
W71-06026 05D

HINDLEY, P. D.
THERMAL DISCHARGE A MODEL - PROTOTYPE COMPARISON,
W71-06095 05B

HINES, W. WILLIAM
LEGAL ASPECTS,
W71-06446 05G

HIRSBLEIFER, JACK
THE TREATMENT OF RISK AND UNCERTAINTY,
W71-05965 06B

HOFFMAN, SIEGFRIED
OVERFLOW STUDIES AT A SEWER SYSTEM OF A METROPOLITAN CITY,
W71-06373 08B

HOGG, THOMAS C.
SOCIO-CULTURAL IMPACTS OF WATER RESOURCE DEVELOPMENT IN THE SANTIAM RIVER BASIN,
W71-05921 06B

HOKANSON, KENNETH E. F.
SOME FACTORS INFLUENCING TOXICITY OF LINEAR ALKYLATE SULFONATE (LAS) TO THE BLUEGILL,
W71-06260 05C

HOLT, R. F.
CHEMISTRY OF SEDIMENT IN WATER,
W71-06431 05B

HOMMERSAND, MAX H.
STUDIES ON ULVA AND OTHER BENTHONIC MARINE ALGAE RECEIVING TREATED SEWAGE IN PONDS AND IN CALICO CREEK AT MOREHEAD CITY, NORTH CAROLINA,
W71-06021 02L

HORTON, JOSEPH
REPORT ON BIOLOGICAL, CHEMICAL, AND GEOLOGICAL STUDIES OF BOIS BRULE AND POPLAR RIVER WATERSHEDS,
W71-05986 05C

HOUSLEY, JOHN G.
VISUAL WAVE OBSERVATIONS ALONG THE LAKE MICHIGAN SHORE,
W71-05899 02H

HOWARD, CLETUS D.
WATER-USE LAW AND ADMINISTRATION IN WISCONSIN,
W71-06192 06E

HOWELLS, DAVID H.
LAND USE FUNCTION IN WATER QUALITY MANAGEMENT,
W71-06310 06B

HOWES, M. A. H.
IMPROVEMENT OF THE CORROSION RESISTANCE OF ALUMINUM BRASS FOR USE IN SEA WATER CONVERSION PLANTS,
W71-06234 08G

HOYT, T. S.
A FEASIBILITY ANALYSIS OF INCINERATOR SYSTEMS FOR RESTORATION OF OIL CONTAMINATED BEACHES,
W71-06252 05E

HUBER, A. LEON
HYDROLOGIC INVENTORY OF THE WEBER RIVER STUDY UNIT,
W71-06220 02E

HUFSCHMIDT, MAYNARD
REGIONAL PLANNING,
W71-05949 06B

HULME, H. S., JR.
ALL YOU SEE IS THE STREAM,
W71-06380 04D

HUNTER, J. V.
THE EFFECT OF CLAY MINERALS ON SURFACTANT BIODEGRADABILITY,
W71-06196 05D

HUTCHINSON, GARY D.
LETTERS TO THE EDITOR--WATCH OUT FOR CROSS CONNECTIONS,
W71-06381 05G

HUTTON, C. C.
GRAND COULE THIRD POWERPLANT NOISE CONTROL STUDY,
W71-06329 08C

HUTTON, J. P.
MEASURING EFFICIENCY IN GOVERNMENT SERVICES,
W71-05957 06B

HUXEL, C. J., JR.
PRELIMINARY REPORT ON THE WATER RESOURCES OF THE WAILUKU AREA,
W71-06155 02E

HYATT, M. LEON
WATER RELATED LAND USE IN THE UTAH LAKE DRAINAGE AREA,
W71-06213 07C

HYDROLOGIC INVENTORY OF THE UTAH LAKE DRAINAGE AREA,
W71-06218 02E

HYLE, ROY, III.
THE USE OF CARBON-14 FOR THE STUDY OF THE UPTAKE AND UTILIZATION OF PHYTOPLANKTON BY RANGEA CUNEATA,
W71-06019 02L

IKAWA, MIYOSHI
ALGAL TOXINS,
W71-05999 02I

IRBE, J. G.
ESTIMATES OF MONTHLY EVAPORATION LOSSES FROM THE GREAT LAKES 1950 TO 1968 BASED ON THE MASS TRANSFER TECHNIQUE,
W71-05892 02D

SOME UNUSUAL SURFACE WATER TEMPERATURE PATTERNS IN THE GREAT LAKES, AS DETECTED BY AIRBORNE RADIATION THERMOMETER SURVEYS,
W71-05898 07B

ISRAELSEN, EUGENE K.
SIMULATION OF RUNOFF FROM URBAN WATERSHEDS,
W71-06306 04C

JACKSON, E. B.
EFFECTS OF IRRIGATION INTENSITY AND NITROGEN LEVEL ON THE PERFORMANCE OF EIGHT VARIETIES OF UPLAND COTTON, GOSSPYIUM HIRSUTUM L.,
W71-06068 03F

JACOBY, HENRY P.
A MODEL OF PUBLIC DECISIONS ILLUSTRATED BY A WATER POLLUTION POLICY PROBLEM,
W71-05939 06A

JAMES, C. P.
WHITHER WATER POLLUTION CONTROL,
W71-06370 05G

JAMES, G. V.
WATER TREATMENT - A GUIDE TO THE TREATMENT OF WATER AND EFFLUENTS PURIFICATION CHAPTER 13 - INTRODUCTORY SEWER SYSTEMS--OVERFLOWS-CONSERVANCY,
W71-06371 05D

JAMES, R. G.
EXPERIMENTAL AND THEORETICAL INVESTIGATIONS OF A PASSIVE EARTH PRESSURE PROBLEM,
W71-05919 08D

JAMES, WESLEY P.
AERIAL PHOTOGRAPHIC TRACING OF PULP MILL EFFLUENT IN MARINE WATERS,
W71-06258 05B

JEHNE, J.
CRITICAL OBSERVATIONS FOR HYDRAULIC MEASUREMENTS OF FIXED STORM-SEWAGE OVERFLOWS,
W71-06372 05G

JENSEN, A. H.
OXIDATION DITCH TREATMENT OF SWINE WASTES, SUMMARY REPORT,
W71-06442 05D

JEPPSON, ROLAND W.
HYDROLOGIC INVENTORY OF THE WEBER RIVER STUDY UNIT,
W71-06220 02E

JIMESON, ROBERT M.
FACTORS IN WASTE HEAT DISPOSAL ASSOCIATED WITH POWER GENERATION,
W71-05932 08A

JOHNSON, CURTIS A.
LIQUID HANDLING OF POULTRY MANURE,
W71-06450 05D

JOHNSON, EDWIN L.
OPTIMUM INVESTMENT IN WATER POLLUTION CONTROL,

W71-05938 06B

JOHNSON, GRANT I.
RURAL WATER DISTRICTS--HERE IS WHY THEY ARE NEEDED,
W71-06061 06B

JOHNSON, H. P.
POLLUTION BY SEDIMENT SOURCES AND THE DETACHMENT AND TRANSPORT PROCESSES,
W71-06430 05B

JOHNSON, JEANNE
NORTH SIDE TREATMENT PLANT CHLORINATION,
W71-05925 05D

JOHNSTON, HERBERT E.
GROUNDWATER RESOURCES OF THE LOYSVILLE AND MIFFLINTOWN QUADRANGLES IN SOUTH-CENTRAL PENNSYLVANIA,
W71-05853 04B

JOHN, JAMES E. A.
THE MIXING OF A SHALLOW SUBMERGED HEATED WATER JET WITH AN AMBIENT RESERVOIR,
W71-06084 05C

JONES, D. D.
OXIDATION DITCH TREATMENT OF SWINE WASTES, SUMMARY REPORT,
W71-06442 05D

JONES, G. W.
THE SURFACE INSTRUMENT NETWORK OF THE UPPER COLORADO RIVER PILOT PROJECT,
W71-06136 07A

JONES, ROBERT H.
A GENERAL REVIEW OF CONTINUOUS WATER QUALITY ANALYSIS INSTRUMENTATION,
W71-06295 05B

JORDAN, GILBERT L.
THE SAN SIMON WATERSHED REVEGETATION,
W71-06223 04D

JORDAN, J. C.
SETTLEMENT PROBLEM ORIENTED COMPUTER LANGUAGE,
W71-05915 08D

KADZHAYA, V.
REGENERATION OF THE SEVAN,
W71-06330 02H

KAMIEN, MORTON
EXTERNALITIES, INFORMATION AND ALTERNATIVE COLLECTIVE ACTION,
W71-05964 06B

KANES, WILLIAM H.
FACIES AND DEVELOPMENT OF THE COLORADO RIVER DELTA IN TEXAS,
W71-05860 02J

KARNAVAS, JAMES A.
CARBONATE BONDING OF COAL REFUSE,
W71-06256 05G

KARTCHNER, ALLEN D.
WATER QUALITY TELEMETRY FINAL PROGRESS REPORT,
W71-06069 05G

KARWEIT, MICHAEL J.
DIFFUSION FROM A CONTINUOUS SOURCE IN A UNIFORM SHEAR FLOW,
W71-05872 05B

KATES, ROBERT
COMPREHENSIVE ENVIRONMENTAL PLANNING,
W71-05950 06B

KATSUYA, A.
EXPERIMENTAL ESTIMATION OF DETENTION IN STORM SEWER SYSTEM,
W71-06404 08B

KAWAHARA, F. K.
CHARACTERIZATION OF OIL SLICKS ON SURFACE WATERS,
W71-06261 05A

KEEFE, CAROLYN W.
POWER PLANTS EFFECTS OF CHLORINATION ON ESTUARINE PRIMARY PRODUCTION,
W71-06097 05C

KELLER, H. E.
DENSE NETWORK FOR RAPID MEASUREMENT OF RAINFALL RATE,
W71-06410 02B

KELLY, C. B.
SANITARY CONTROL OF SHELLFISH IN KOREA,
W71-06110 02L

KELMAN, SHELDON
EFFECTS OF SURFACE RUNOFF ON THE FEASIBILITY OF MUNICIPAL ADVANCED WASTE TREATMENT,
W71-06445 05D

KENNEDY, V. S.
THERMAL POLLUTION, AQUACULTURE AND PATHOBIOLOGY IN AQUATIC SISTEMS,
W71-06092 05C

KESTER, DANA R.
SODIUM, MAGNESIUM, AND CALCIUM SULFATE ION-PAIRS IN SEAWATER AT 25C,
W71-06166 02K

KHER, RAMESH K.
PREDICTION OF MOISTURE MOVEMENT IN EXPANSIVE CLAYS,
W71-06272 02G

KIEL, EDWARD
WATER POLLUTION OBSERVATIONS ON CONNECTICUT'S RESPONSE,
W71-06047 05G

KILAMBI, RAJ V.
TEMPERATURE SELECTION AND HEAT RESISTANCE OF THE MOSQUITO FISH, GAMBUSIA AFFINIS,
W71-06180 05C

KIM, SEONG JUN
SANITARY CONTROL OF SHELLFISH IN KOREA,
W71-06110 02L

KINCANNON, D. F.
SOME EFFECTS OF HIGH SALT CONCENTRATIONS ON ACTIVATED SLUDGE,
W71-06034 05D

KING, M. V.
DEVELOPMENTS IN SEWER MONITORING EQUIPMENT AND TECHNIQUES,
W71-06428 08B

KISIEL, CHESTER C.
OPERATIONS RESEARCH STUDY OF WATER RESOURCES - PART II,
W71-06307 06A

KLYACHKO-GURVICH, G. L.
ON THE OCCURRENCE OF TRANS-3-HEXADECANOIC ACID IN CHLORELLA CELLS, (IN RUSSIAN),
W71-05989 02K

KNECHT, CHARLES
THE SEWER HAD TO BE CLEANED BEFORE SNOWFALL,
W71-06396 05G

KNEESE, ALLEN V.
STRATEGIES FOR ENVIRONMENTAL MANAGEMENT,
W71-05935 06B

THE 'PROBLEM SHED' AS A UNIT FOR ENVIRONMENTAL CONTROL,
W71-05945 06B

KNETSCH, JACK L.
ECONOMIC ANALYSIS IN NATURAL RESOURCE PROGRAMS,
W71-05940 06B

KNUTILLA, R. L.
WATER RESOURCES OF THE BLACK RIVER BASIN, SOUTHEASTERN MICHIGAN,
W71-05869 07C

KOCH, W.
FUNGAL SURVEY IN WASTE PONDS AND CREEK,
W71-06013 02L

KOLLAR, K. L.
WATER REQUIREMENTS FOR MANUFACTURING,
W71-06318 06D

WATER USE BY APPALACHIAN MANUFACTURERS,
W71-06319 06D

KOLLMORGEN, WALTER M.
THE WOODSMAN'S ASSAULTS ON THE DOMAIN OF THE CATTLEMAN,
W71-06072 03F

KOLYCHEV, B. S.
THE PRESENT STATE AND PROSPECTS OF DEVELOPMENT IN RADIOACTIVE WASTE MANAGEMENT IN THE USSR,
W71-06006 05E

KOVALCIK, E. J.
UNDERSTANDING SYSTEMS ENGINEERING,
W71-05918 06A

KREMEN, S. S.
STUDY AND EXPERIMENTS IN WASTE WATER RECLAMATION BY REVERSE OSMOSIS,
W71-06025 05D

KRONE, RAY B.
SHEARING EFFECTS ON SETTLING OF ACTIVATED SLUDGE,
W71-06029 05D

KUENZLER, EDWARD J.
PHOSPHORUS FLUX BETWEEN WATER AND PLANKTON A PRELIMINARY REPORT,
W71-06018 02L

PHYTOPLANKTON POPULATIONS A PRELIMINARY REPORT,
W71-06022 02L

KUTZBACH, JOHN E.
MULTIVARIATE TECHNIQUES FOR SPECIFYING TREE-GROWTH AND CLIMATE RELATIONSHIPS AND FOR RECONSTRUCTING ANOMALIES IN PALEOCLIMATE,
W71-05851 02B

KYLE, C. R.
TURBULENT DISPERSION IN POROUS MATERIALS AS MODELED BY A MIXING CELL WITH STAGNANT ZONE,
W71-06122 02F

LANDSBERG, DENNIS R.
JULY CURRENTS NEAR THE SOUTH SHORE OF LAKE ONTARIO,
W71-05978 02H

LANE, D. E.
PLANTING CORN IN NATIVE SOD,
W71-06060 03F

LANGHAM, MAX R.
PESTICIDE RESIDUES AND ENVIRONMENTAL ECONOMICS,
W71-05951 05G

LAPORTE, G.
INVESTIGATIONS OF THE TECHNIQUES OF PURIFICATION OF ALGAL CULTURES ELABORATION OF METHODS APPLICABLE TO DESMIDS, FILAMENTOUS CYANOPHYTES, AND DIATOMS, (IN FRENCH),
W71-06002 07B

LAROSA, PAUL J.
CARBONATE BONDING OF COAL REFUSE,
W71-06256 05G

LARSON, THURSTON E.
NITRATE POLLUTION OF WATER,
W71-06130 05B

LASKOWSKI, S. L.
STATISTICAL SUMMARIES OF NEW JERSEY STREAMFLOW RECORDS,
W71-06228 07C

LAUGHLIN, CHARLES P.
AVAILABILITY OF GROUNDWATER IN CHARLES COUNTY, MARYLAND,
W71-06168 02F

LAUTRICH, R.
NEW REGULATIONS AND CONSTRUCTIONS OF STORM-SEWAGE OVERFLOWS, FOR THE RELIEF OF RECEIVING WATERS,
W71-06382 08B

LAVERTY, B. R.
COOLING WATER RESOURCES AND POWER GENERATION,
W71-06091 05G

LAVERTY, C.
WATER POLLUTION CONTROL. 5 BILLION DOLLARS TAB,
W71-06297 05G

LAWLER, J. P.
PRELIMINARY PROCESS DESIGN AND TREATABILITY STUDIES OF FISH PROCESSING WASTES,
W71-06035 05D

LAWRENCE, R. F.
TRANSMISSION IN THE 70'S,
W71-05912 08C

LAW, JAMES P., JR.
DEGRADATION OF WATER QUALITY IN IRRIGATION RETURN FLOWS,
W71-06063 03F

LAW, J. P., JR.
PROBLEMS OF POLLUTION OF IRRIGATION WATERS IN ARID REGIONS,
W71-06112 05B

LEACH, LOWELL E.
INDUCED HYPOLIMNION AERATION FOR WATER QUALITY IMPROVEMENT OF POWER RELEASES,
W71-06251 05G

LEE, E. S.
WATER QUALITY MODELING AND PREDICTION,
W71-06186 05G

LEE, G. FRED
WATER CHEMISTRY OF TOXAPHENE - ROLE OF LAKE SEDIMENTS,
W71-05840 05B

LEE, H. V.
SOME ASPECTS OF SEWAGE TREATMENT AT COVENTRY,
W71-06366 05D

LEIGHTON, DAVID L.
MARINE WASTE DISPOSAL AND SEA URCHIN ECOLOGY,
W71-06262 05C

LEITZ, FRANK B.
RESEARCH ON PIEZODIALYSIS - SECOND REPORT,
W71-06236 03A

LENARZ, WILLIAM H.
SIMULATION OF A WATER RESOURCE SYSTEM, FINAL REPORT,
W71-06066 05G

LEONARD, O. A.
STUDIES ON THE CHEMICAL CONTROL OF TREE ROOTS IN SEWER LINES,
W71-06397 04A

LEPS, T. M.
REVIEW OF SHEARING STRENGTH OF ROCKFILL,
W71-05910 08D

LESHNIOWSKY, WALTER O.
ALDRIN REMOVAL FROM LAKE WATER BY FLOCCULENT BACTERIA,
W71-06000 05G

LEWIS, ROBERT LEWIS
MARGINAL COSTS OF ALTERNATIVE LEVELS OF WATER QUALITY IN THE UPPER MISSISSIPPI RIVER,
W71-06191 05G

LINFIELD, WARNER M.
DEVELOPMENT OF PHOSPHATE-FREE HOME LAUNDRY DETERGENTS,
W71-06247 05G

LINGLE, J. C.
EFFECT OF SOIL TEMPERATURE ON THE AVAILABILITY OF PHOSPHORUS IN ANIMAL MANURES,
W71-06455 05C

LIPHSCHITZ, NILI
ENVIRONMENTAL EFFECTS ON WOOD PRODUCTION AND CAMBIAL ACTIVITY IN ZIZIPHUS SPINACHRISTI (L.) WILLD.,
W71-06214 02I

LIPPER, R. I.
EFFECT OF FEEDLOT LAGOON WATER ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF SOILS,
W71-05974 05C

LIU, M. K.
BOUNDARY LAYER FLOW PROBLEMS IN DESALINATION BY REVERSE OSMOSIS,
W71-06237 03A

LIU, PAUL C.
VISUAL WAVE OBSERVATIONS ALONG THE LAKE MICHIGAN SHORE,
W71-05899 02H

LIVERMORE, D. F.
PHYSICAL PROPERTIES AND PROCESSING CHARACTERISTICS OF MACROPHYTES AS RELATED TO MECHANICAL HARVESTING,
W71-06188 04A

LOCK, ANTHONY R.
THE EFFECT OF VARYING AND CONSTANT TEMPERATURES ON THE SIZE OF A MARINE COPEPOD,
W71-06083 05C

LOEHR, R. C.
ALTERNATIVES FOR THE TREATMENT AND DISPOSAL OF ANIMAL WASTES,
W71-06044 05D

LOGAN, T. H.
GRAND COULE THIRD POWERPLANT NOISE CONTROL STUDY,
W71-06329 08C

LOHRMANN, ROBERT R.
THE ENVIRONMENTAL LAWSUIT TRADITIONAL DOCTRINES AND EVOLVING THEORIES TO CONTROL POLLUTION,
W71-06048 05G

LOMBARDO, G.
PROBLEM OF FLOOD-CONTROL IN SMALL BASINS,
W71-06298 07C

LONDE, P.
STABILITY OF ROCK SLOPES--GRAPHICAL METHODS,
W71-05909 02E

LOUGH, JACK
PAVING CURES DUST AND DRAINAGE ILLS,
W71-06383 08F

LOVE, W. J.
SUSQUEHANNA RIVER BASIN STUDY (SUMMARY),
W71-06227 06B

LOWRY, L. L.
A BREAK FROM ACCEPTED PRACTICE . . . BRINGS STORM-WATER CONTROL WITHIN REACH OF OUR BOROUGH'S POCKETBOOK,
W71-06384 05G

LUCAS, K. C.
HEAVY METAL POLLUTION POLICY AND PROGRAM IMPLICATIONS FOR THE PROTECTION OF THE ECOSYSTEM,
W71-06078 05A

LUDWIG, H. F.
CHARACTERIZATION AND CONTROL OF COMBINED SEWER OVERFLOWS, SAN FRANCISCO,
W71-06326 08B

LUMSDEN, T. W.
WATER STORAGE METHODS -- FROM CUPPED HANDS TO COMPUTERS,
W71-06385 08A

LUTES, D. A.
SNOW LOADS FOR THE DESIGN OF ROOFS IN CANADA,
W71-06143 08A

LUTHIN, JAMES N.
COMPUTER METHODS FOR TRANSIENT ANALYSIS OF WATER-TABLE AQUIFERS,
W71-05920 02F

LYTTON, ROBERT L.
PREDICTION OF MOISTURE MOVEMENT IN EXPANSIVE CLAYS,
W71-06272 02G

MACKAY, A. M.
PORT ELGIN'S OXIDATION DITCH,
W71-06027 05D

MAGNO, P.
LIQUID WASTE EFFLUENTS FROM A NUCLEAR FUEL REPROCESSING PLANT,
W71-06269 05B

MAHAJAN, BAL M.
THE MIXING OF A SHALLOW SUBMERGED HEATED WATER JET WITH AN AMBIENT RESERVOIR,
W71-06084 05C

MALCOLM, W. J.
LOW-PRESSURE AIR TESTS FOR SEWER LINES,
W71-06299 08A

MALINA, H.
THE NUMERICAL DETERMINATION OF STRESSES AND DEFORMATIONS IN ROCK TAKING INTO ACCOUNT DISCONTINUITIES,
W71-05917 08E

MANASSE, EDWARD W.
WATER POLLUTION OBSERVATIONS ON CONNECTICUT'S RESPONSE,
W71-06047 05G

MANNY, BRUCE A.
DIURNAL CHANGES IN STRATIFICATION AND DISSOLVED OXYGEN IN THE SURFACE WATERS OF LAKE MICHIGAN,
W71-05900 02H

MANN, R. H. K.
A PRELIMINARY STUDY OF THE FEEDING RELATIONSHIPS OF FISH IN A HARD-WATER AND A SOFT-WATER STREAM IN SOUTHERN ENGLAND,
W71-06327 05C

MARQUARDT, WILLIAM
FIBERGLASS WINS PIPELINE,
W71-06300 08G

MARSDEN-JONES, G. L.
SEWERS UNDER ATTACK,
W71-06301 08G

MARSHALL, DAVID E.
CHARACTERISTICS OF SPARTINA MARSH WHICH IS RECEIVING TREATED MUNICIPAL SEWAGE WASTES,
W71-06014 02L

MARTIN, W. P.
FERTILIZER MANAGEMENT FOR POLLUTION CONTROL,
W71-06437 05G

MASARCHIA, SAM C.
FIRST YEAR RECORD OF TOTAL METABOLISM OF MARINE PONDS RECEIVING TREATED WASTES,
W71-06023 02L

MATHUR, SATYENDRA P.
THERMAL CRITERIA - A MEASURE TO CONTROL THERMAL POLLUTION,
W71-06096 05C

MATUSKY, F. E.
PRELIMINARY PROCESS DESIGN AND TREATABILITY STUDIES OF FISH PROCESSING WASTES,
W71-06035 05D

MAUD, D. H.
THE WRAY FLOOD DISASTER AND ITS EFFECTS ON THE PUBLIC HEALTH SERVICES,
W71-06386 05F

MAYNARD, MICHAEL L.
THE SAN SIMON WATERSHED REVEGETATION,
W71-06223 04D

MCERLEAN, A. J.
THERMAL POLLUTION, AQUACULTURE AND PATHOBIOLOGY IN AQUATIC SYSTEMS,
W71-06092 05C

MCJUNKIN, F. E.
PRACTICAL HYDRAULICS FOR PUBLIC WORKS ENGINEER,
W71-06398 08B

MCKEE, EDWIN D.
DEFORMATION OF LEE-SIDE LAMINAE IN EOLIAN DUNES,
W71-05845 02J

MCKEE, G. D.
CHEMICAL CHARACTERIZATION OF BOTTOM SEDIMENTS,
W71-05981 05A

MCKELLAR, HENRY
PHOSPHORUS FLUX BETWEEN WATER AND PLANKTON A PRELIMINARY REPORT,
W71-06018 02L

MCLAREN, IAN A.
THE EFFECT OF VARYING AND CONSTANT TEMPERATURES ON THE SIZE OF A MARINE COPEPOD,
W71-06083 05C

MCLENDON, S. C.
WATER RESOURCES OF NASSAU AND SUFFOLK COUNTIES,
W71-05843 03D

MCNABB, COY G.
PUBLIC WATER FOR RURAL AREAS AND SMALL TOWNS,
W71-05973 06D

MCPHERSON, BENJAMIN F.
WATER QUALITY AT THE DADE-COLLIER TRAINING AND TRANSITION AIRPORT, MIAMI INTERNATIONAL AIRPORT, AND COTTONMOUTH CAMP-EVERGLADES NATIONAL PARK, FLORIDA, NOVEMBER, 1969,
W71-06158 05A

MCWHIRTER, J. R.
FUNDAMENTAL ASPECTS OF SURFACE AERATOR PERFORMANCE AND DESIGN,
W71-06030 05D

MCWHORTER, J. C.
DEPTH OF FLOW AS DESIGN CRITERION FOR CHANNELS WITH ARTIFICIAL LINERS,
W71-06399 08B

MEHRA, R. B.
PHYSIOLOGY OF BOLL SHEDDING IN COTTON IV. CORRELATION STUDIES ON FLOWER PRODUCTION AND BOLL SHEDDING IN RELATION TO TEMPERATURE AND RAINFALL,
W71-06056 03F

MEHROTRA, S. N.
OBSERVATIONS ON FLUCTUATIONS IN THE ABUNDANCE OF PLANKTON IN RELATION TO CERTAIN HYDROLOGICAL CONDITIONS OF RIVER GANGA,
W71-06004 02I

MEIRI, A.
EFFECT OF TIME OF EXPOSURE TO SALINITY ON GROWTH, WATER STATUS AND SALT ACCUMULATION IN BEAN PLANTS,
W71-06074 02I

MERCER, WALTER A.
WASTE REDUCTION IN FOOD CANNING OPERATIONS,
W71-06257 05D

MEREDITH, D. D.
WATER RESOURCES SYSTEMS ANALYSIS OF DISCRETE DIFFERENTIAL DYNAMIC PROGRAMMING,
W71-05922 06A

MERZ, ROBERT C.
SPECIAL STUDIES OF A SANITARY LANDFILL,
W71-06103 05B

MEYER, FRED P.
A POTENTIAL CONTROL FOR LEECHES,
W71-06322 05C

MEYER, FREDERICK W.
SALINE ARTESIAN WATER AS A SUPPLEMENT,
W71-06124 03C

MIHURSKY, J. A.
INTRODUCTION, PROCEEDINGS OF 2ND THERMAL WORKSHOP OF UNITED STATES INTERNATIONAL BIOLOGICAL PROGRAM,
W71-06075 05C

THERMAL POLLUTION, AQUACULTURE AND PATHOBIOLOGY IN AQUATIC SYSTEMS,
W71-06092 05C

POWER PLANTS EFFECTS OF CHLORINATION ON ESTUARINE PRIMARY PRODUCTION,
W71-06097 05C

MILLER, ARTHUR P.
WATER AND MAN'S HEALTH,
W71-06108 05F

MILLER, FRED P.
POLLUTION - ARE FERTILIZERS AT FAULT,
W71-05996 05B

MINER, R. M.
THERMAL DISCHARGE A MODEL - PROTOTYPE COMPARISON,
W71-06095 05B

MITCHELL, CHARLES T.
MARINE WASTE DISPOSAL AND SEA URCHIN ECOLOGY,
W71-06262 05C

MOLDENHAUER, W. C.
POLLUTION BY SEDIMENT SOURCES AND THE DETACHMENT AND TRANSPORT PROCESSES,
W71-06430 05B

MONAHAN, EDWARD C.
GEOLOGICAL, CHEMICAL, AND PHYSICAL ATTRIBUTES OF SEDIMENTS IN SENECA LAKE, NEW YORK,
W71-05890 02J

MOR, E.
EFFECT OF TIME OF EXPOSURE TO SALINITY ON GROWTH, WATER STATUS AND SALT ACCUMULATION IN BEAN PLANTS,
W71-06074 02I

MOSTERTMAN, L. J.
RECONNAISSANCE INVESTIGATION OF THE SUBSIDENCE OF VENICE AND SUGGESTED STEPS TOWARD ITS CONTROL,
W71-05870 02F

MURPHY, L. S.
EFFECT OF FEEDLOT LAGOON WATER ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF SOILS,
W71-05974 05C

MURRAY, R. B.
SOME ASPECTS OF BIOLOGY OF CARCINUS MAENAS (L) II SURVIVAL AT LOW SALINITY,
W71-06179 05C

MURRAY, WILLARD A.
SEEPAGE FACE EFFECTS IN UNSTEADY GROUNDWATER FLOW,
W71-06190 02F

MURTHY, C. R.
LARGE-SCALE DIFFUSION STUDIES AT NIAGARA RIVER MOUTH, LAKE ONTARIO,
W71-05901 07B

MUSE, BARBARA
PHOSPHORUS FLUX BETWEEN WATER AND PLANKTON A PRELIMINARY REPORT,

W71-06018 02L

MYER, GLENN E.
A FIELD STUDY OF LANGMUIR CIRCULATIONS,
W71-05884 02H

ON THE MECHANISM OF LANGMUIR CIRCULATIONS AND THEIR ROLE IN EPILIMNION MIXING,
W71-05975 02H

MYKLAND, GUNNAR K.
THE ENFORCEMENT PHASE OF POLLUTION ABATEMENT THE ROLE OF THE ARMY ENGINEERS,
W71-06055 05G

NACHMAN, J. F.
APPLICATION OF IRON-ALUMINUM BASE ALLOYS TO SALINE WATER CONVERSION,
W71-06235 08G

NAMKEN, L. N.
WATER USE BY COTTON FROM LOW AND MODERATELY SALINE STATIC WATER TABLES,
W71-06221 03C

NARAYANA PILLAI, N.
ON UNIFORM FLOW THROUGH SMOOTH RECTANGULAR OPEN CHANNELS,
W71-05863 08B

NARAYANA, V. V. DHRUVA
SIMULATION OF RUNOFF FROM URBAN WATERSHEDS,
W71-06306 04C

NEIHEISEL, T. W.
AN ELECTRODE CHAMBER FOR RECORDING RESPIRATORY AND OTHER MOVEMENTS OF FREE-SWIMMING ANIMALS,
W71-06328 05A

NEILL, WILLIAM H., JR.
TEMPERATURE SELECTION AND HEAT RESISTANCE OF THE MOSQUITO FISH, GAMBUSIA AFFINIS,
W71-06180 05C

NELSON, BRUCE W.
HYDROGRAPHY, SEDIMENT DISPERSAL, AND RECENT HISTORICAL DEVELOPMENT OF THE PO RIVER DELTA, ITALY,
W71-05859 02J

NEUHOLD, JOHN M.
NATURAL POLLUTION IN ARID LAND WATERS,
W71-06113 05B

NEUHOLD, J. M.
EFFECTS OF ALKYL BENZENE SULFONATE ON RAINBOW TROUT,
W71-06325 05C

NEUMANN, HEINRICH
REMARKS ON THE DRIFT OF OILY WASTE IN THE BAY OF HELGOLAND (IN GERMAN),
W71-06206 05B

NEVINS, T. H. F.
THE MATTHES ROLLING DIAMETER AS AN INDICATOR OF CHANNEL STABILITY,
W71-06169 02J

NEWLAND, E. A.
RADIATION TREATMENT OF SEWAGE,
W71-06271 05D

NIAUSSAT, P.
POLLUTION, BY BIOSYNTHESIS 'IN SITU' OF CARCINOGENOUS HYDROCARBONS, OF A LAGOON BIOCENOSIS 'IN VITRO' REPRODUCTION OF THIS PHENOMENON (IN FRENCH),
W71-06209 05B

NICHOLSON, H. PAGE
THE PESTICIDE BURDEN IN WATER AND ITS SIGNIFICANCE,
W71-06439 05B

NING, HSI TANG
MOISTURE TRANSPORT IN SLUDGE DEWATERING AND DRYING ON SAND BEDS,
W71-06031 05D

NIX, J.
DISTRIBUTION OF TRACE METALS IN IMPOUNDMENTS,
W71-05971 05B

NOBLE, V. E.
STATISTICAL ANALYSIS OF CURRENTS AT TWO NEAR-BY STATIONS IN LAKE MICHIGAN, SUMMER, 1967,
W71-05893 02H

NORTH, CHARLES R.
SOLVING A SEWER OVERFLOW PROBLEM,
W71-06387 08C

NORTH, J. C.
HYDRAULIC OVERLOADING-FACT OR FICTION,
W71-06198 05D

NORTH, WHEELER J.
MARINE WASTE DISPOSAL AND SEA URCHIN ECOLOGY,
W71-06262 05C

NORUM, D. I.
DENSITIES OF PRAIRIE SNOWPACKS,
W71-06137 02C

NUSBAUM, I.
STUDY AND EXPERIMENTS IN WASTE WATER RECLAMATION BY REVERSE OSMOSIS,
W71-06025 05D

OBEDKOFF, W.
USING ALL AVAILABLE HYDROLOGIC DATA,
W71-06138 07C

ODUM, HOWARD T.
FIRST YEAR RECORD OF TOTAL METABOLISM OF MARINE PONDS RECEIVING TREATED WASTES,
W71-06023 02L

ODUM, H. T.
STUDIES OF MARINE ESTUARINE ECOSYSTEMS DEVELOPING WITH TREATED SEWAGE WASTES,
W71-06012 02L

OGDEN, P. R.
PINYON-JUNIPER CONTROL WHERE. WHY,
W71-06225 04D

OKUBO, AKIRA
DIFFUSION FROM A CONTINUOUS SOURCE IN A UNIFORM SHEAR FLOW,
W71-05872 05B

OLSEN, ROLF A.
EVALUATION OF AN AUTOMATIC CHEMICAL ANALYSIS MONITOR FOR WATER QUALITY PARAMETERS,
W71-06005 05A

OOMKENS, EPPO
DEPOSITIONAL SEQUENCES AND SAND DISTRIBUTION IN THE POSTGLACIAL RHONE DELTA COMPLEX,
W71-05857 02J

ORR, D. R. O.
A PRELIMINARY STUDY OF THE FEEDING RELATIONSHIPS OF FISH IN A HARD-WATER AND A SOFT-WATER STREAM IN SOUTHERN ENGLAND,
W71-06327 05C

OSWALD, W. J.
TREATMENT OF ORGANIC INDUSTRIAL WASTES BY LAGOONING,
W71-06036 05D

OTTON, E. G.
AVAILABILITY OF GROUNDWATER IN CHARLES COUNTY, MARYLAND,
W71-06168 02F

OTTO, NAMAN E.
ALGAECIDAL EVALUATION AND ENVIRONMENTAL STUDY OF MAT PRODUCING BLUEGREEN ALGAE,
W71-06102 04A

OVERFIELD, J. L.
INCREASING SEWAGE FLOW VELOCITY BY USING CHEMICAL ADDITIVES,
W71-06400 08B

OWEN, JOHN D.
THE DEMAND FOR LEISURE,
W71-05970 06D

O'BRIEN, JAMES E.
EVALUATION OF AN AUTOMATIC CHEMICAL ANALYSIS MONITOR FOR WATER QUALITY PARAMETERS,
W71-06005 05A

O'ROURKE, J. T.
PINYON-JUNIPER CONTROL WHERE. WHY,
W71-06225 04D

PAESSLER, A. H.
CONTROL OF WASTES FROM WATER TREATMENT PLANTS,
W71-06200 05D

PAGAN, ALFRED R.
FLOOD CONTROL DESIGN UTILIZES LARGE ELLIPTICAL PIPE,
W71-06302 08A

LONG-TIME DRAINAGE PROBLEM IS ELIMINATED,
W71-06405 08B

PAHWA, D. V.
OBSERVATIONS ON FLUCTUATIONS IN THE ABUNDANCE OF PLANKTON IN RELATION TO CERTAIN HYDROLOGICAL CONDITIONS OF RIVER GANGA,
W71-06004 02I

PAINTAL, A. S.
HYDRAULIC DESIGN OF SELF-CLEANING SEWAGE TUNNELS,
W71-06401 08B

PARKER, F. L.
MOISTURE TRANSPORT IN SLUDGE DEWATERING AND DRYING ON SAND BEDS,
W71-06031 05D

PARKER, JAMES T.
THE FACTS BEHIND THE MERCURY,
W71-06100 05A

PATRICK, WM. H., JR.
UREA CONVERSION TO AMMONIA IN WATERLOGGED SOILS,
W71-05866 02K

PATTERSON, GLENN W.
ENVIRONMENTALLY-INDUCED CHANGES IN THE FATTY ACIDS OF CHLORELLA,
W71-05992 02I

PEACOCK, ALAN T.
QUANTITATIVE ANALYSIS IN PUBLIC FINANCE,

W71-05947 06A

THE FISCAL ECONOMIST AND QUANTITATIVE ANALYSIS,
W71-05956 06C

PEARCE, J. B.
INTRODUCTION, PROCEEDINGS OF 2ND THERMAL WORKSHOP OF UNITED STATES INTERNATIONAL BIOLOGICAL PROGRAM,
W71-06075 05C

PEARSE, JOHN S.
MARINE WASTE DISPOSAL AND SEA URCHIN ECOLOGY,
W71-06262 05C

PELCZARSKI, EUGENE A.
CARBONATE BONDING OF COAL REFUSE,
W71-06256 05G

PENAS, E. J.
HOW TO SELECT AND APPLY ZINC FERTILIZER,
W71-06059 03F

PENNAK, ROBERT W.
COLORADO SEMIDRAINAGE MOUNTAIN LAKES,
W71-06165 02H

PERKINS, E. J.
SOME ASPECTS OF BIOLOGY OF CARCINUS MAENAS (L) II SURVIVAL AT LOW SALINITY,
W71-06179 05C

PERRINE, R. L.
TURBULENT DISPERSION IN POROUS MATERIALS AS MODELED BY A MIXING CELL WITH STAGNANT ZONE,
W71-06122 02F

PETERKA, JOHN J.
PRIMARY PRODUCTION AND CHEMICAL AND PHYSICAL CHARACTERISTICS OF LAKE ASHTABULA RESERVOIR, NORTH DAKOTA,
W71-06008 02H

PETERSON, D. L.
WATER RESOURCES OF THE HEBER-KAMAS-PARK CITY AREA, NORTH-CENTRAL UTAH,
W71-05852 02E

PETERSON, FRANK L.
ARTIFICIAL RECHARGE PRACTICES IN HAWAII,
W71-06263 04B

PETERSON, H. B.
PROBLEMS OF POLLUTION OF IRRIGATION WATERS IN ARID REGIONS,
W71-06112 05B

PETERS, DAVID S.
A STUDY OF RELATIONSHIPS BETWEEN ZOOPLANKTON ABUNDANCE AND SELECTED ENVIRONMENTAL VARIABLES IN THE PAMLICO RIVER ESTUARY OF EASTERN NORTH CAROLINA,
W71-05985 02I

PETERS, DON C.
PESTICIDES AND PEST MANAGEMENT FOR MAXIMUM PRODUCTION AND MINIMUM POLLUTION,
W71-06441 05G

PETRAUSKAS, C.
EXTRAPOLATION OF HISTORICAL STORM DATA FOR ESTIMATING DESIGN WAVE HEIGHTS,
W71-06123 07C

PFISTER, ROBERT M.
ALDRIN REMOVAL FROM LAKE WATER BY FLOCCULENT BACTERIA,
W71-06000 05G

PHILLIPS, SAM A.
STEEL STORM SEWER SAVES MONEY FOR PHOENIX,
W71-06406 08G

PIPES, A.
SIMULATING SNOWMELT HYDROGRAPHS FOR THE FRASER RIVER SYSTEM,
W71-06147 02A

PIPES, W. O., JR.
PROCESS OPTIMA IN ACTIVATED SLUDGE,
W71-06032 05D

PLUMMER, CHARLES W.
RESEARCH ON PIEZODIALYSIS - SECOND REPORT,
W71-06236 03A

POHL, EDWARD F.
A RATIONAL APPROACH TO THE DESIGN OF AERATED SEWAGE LAGOONS,
W71-06267 05D

POLAND, J. F.
RECONNAISSANCE INVESTIGATION OF THE SUBSIDENCE OF VENICE AND SUGGESTED STEPS TOWARD ITS CONTROL,
W71-05870 02F

POLENTZ, L. M.
STUDY OF EQUIPMENT AND METHODS FOR REMOVING OR DISPERSING OIL FROM OPEN WATERS,
W71-06106 05G

POLJAKOFF-MAYBER, ALEXANDRA
EFFECT OF TIME OF EXPOSURE TO SALINITY ON GROWTH, WATER STATUS AND SALT ACCUMULATION IN BEAN PLANTS,
W71-06074 02I

POLOCSIK, S.
PROCESS OPTIMA IN ACTIVATED SLUDGE,
W71-06032 05D

POMEROY, R. D.
CALCAREOUS PIPE FOR SEWERS,
W71-06407 08F

PORTER, J. W.
ECONOMICS OF COMBINING DISTILLED SEAWATER AND RENOVATED WASTE WATER AS A NEW SOURCE OF MUNICIPAL WATER SUPPLY,
W71-06238 03A

POST, F. J.
ECOLOGY OF SELECTED BACTERIA IN A SMALL INTERMITTENT SEWAGE POND,
W71-05995 05D

POTASH, MILTON
LAKE CHAMPLAIN IN RELATION TO REGIONAL WATER SUPPLY,
W71-05875 03B

POURRIOT, R.
INVESTIGATIONS OF THE TECHNIQUES OF PURIFICATION OF ALGAL CULTURES ELABORATION OF METHODS APPLICABLE TO DESMIDS, FILAMENTOUS CYANOPHYTES, AND DIATOMS, (IN FRENCH),
W71-06002 07B

POWERS, W. L.
EFFECT OF FEEDLOT LAGOON WATER ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF SOILS,
W71-05974 05C

PRASAD, C.
AN INTERFEROMETRIC TECHNIQUE FOR TEMPERATURE AND CONCENTRATION MEASUREMENT FOR AN AIR-WATER INTERFACE,
W71-06090 05A

PRICE, M. J.
SOME ASPECTS OF SEWAGE TREATMENT AT COVENTRY,
W71-06366 05D

PYKE, CHARLES B.
PACIFIC OCEAN INFLUENCE UPON CALIFORNIA RAINFALL,
W71-06115 02B

PYTKOWICZ, RICARDO M.
SODIUM, MAGNESIUM, AND CALCIUM SULFATE ION-PAIRS IN SEAWATER AT 25C,
W71-06166 02K

QUICK, MICHAEL C.
LABORATORY SIMULATION OF SNOWMELT,
W71-06139 02C

QUICK, M. C.
SIMULATING SNOWMELT HYDROGRAPHS FOR THE FRASER RIVER SYSTEM,
W71-06147 02A

QUIRK, T. P.
PRELIMINARY PROCESS DESIGN AND TREATABILITY STUDIES OF FISH PROCESSING WASTES,
W71-06035 05D

RABE, FRED W.
SOME EFFECTS OF ANTIMYCIN IN AN OLIGOTROPHIC LAKE,
W71-06323 05C

RADEMACHER, JOHN M.
ANIMAL WASTE RUNOFF--A MAJOR WATER QUALITY CHALLENGE,
W71-06114 05B

ALLIANCE FOR ACTION,
W71-06448 05G

RAGOTZKIE, R. A.
SUMMER THERMAL STRUCTURE AND CIRCULATION OF CHEQUAMEGON BAY, LAKE SUPERIOR--A FLUCTUATING SYSTEM,
W71-05885 02H

RANDLES, CHESTER I.
ALDRIN REMOVAL FROM LAKE WATER BY FLOCCULENT BACTERIA,
W71-06000 05G

RAO, R.
FUNGAL SURVEY IN WASTE PONDS AND CREEK,
W71-06013 02L

RAO, MANAM V. P.
HYDRODYNAMIC EFFECTS OF SEEPAGE ON BED PARTICLES,
W71-05839 02J

RAPPAPORT, ALFRED
INFORMATION FOR DECISION MAKING,
W71-05953 06B

SENSITIVITY ANALYSIS IN DECISION MAKING,
W71-05955 06B

REAVEY, T.
LIQUID WASTE EFFLUENTS FROM A NUCLEAR FUEL REPROCESSING PLANT,
W71-06269 05B

REED, LESTER W.
DEGRADATION OF WATER QUALITY IN IRRIGATION RETURN FLOWS,
W71-06063 03F

REED, SHERWOOD
SETTLING CHARACTERISTICS OF ACTIVATED SLUDGE AT LOW TEMPERATURE,
W71-06107 05D

REHM, R. G.
THE EFFECTS OF THERMAL DISCHARGES ON THE STRATIFICATION CYCLE OF LAKES,
W71-06082 05C

REID, LEONARD A.
PRIMARY PRODUCTION AND CHEMICAL AND PHYSICAL CHARACTERISTICS OF LAKE ASHTABULA RESERVOIR, NORTH DAKOTA,
W71-06008 02H

REIS, ROBERT I.
CONNECTICUT WATER LAW JUDICIAL ALLOCATION OF WATER RESOURCES,
W71-06273 06E

RELINI, G.
POSSIBILITY OF STUDYING THE EFFECTS OF POLLUTION ON BENTHIC ORGANISMS EMPLOYING IMMERSED PANELS (IN FRENCH),
W71-06205 05C

REMMERT, HERMANN
INFLUENCE OF INDUSTRIAL EFFLUENTS ON ARTHROPODS OF THE MARINE SUPRALITTORAL ZONE, (IN GERMAN),
W71-06003 05C

RESNIK, ANTHONY V.
ANIMAL WASTE RUNOFF--A MAJOR WATER QUALITY CHALLENGE,
W71-06114 05B

RHODEHAMEL, EDWARD C.
A HYDROLOGIC ANALYSIS OF THE NEW JERSEY PINE BARRENS REGION,
W71-06125 02A

RHYNE, CHARLES F.
STUDIES ON ULVA AND OTHER BENTHONIC MARINE ALGAE RECEIVING TREATED SEWAGE IN PONDS AND IN CALICO CREEK AT MOREHEAD CITY, NORTH CAROLINA,
W71-06021 02L

RIACH, J. S. W.
INSULATED CO-AXIAL PIPELINES,
W71-06408 08G

RICHARDSON, GEORGE R.
FE CL3 ADDITION EXPERIMENTS FOR IMPROVED EFFLUENT QUALITY AT THE CALUMET TREATMENT PLANT, INTERIM REPORT,
W71-05927 05D

RICHARDS, T. L.
ESTIMATES OF MONTHLY EVAPORATION LOSSES FROM THE GREAT LAKES 1950 TO 1968 BASED ON THE MASS TRANSFER TECHNIQUE,
W71-05892 02D

RILEY, J. PAUL
SIMULATION OF RUNOFF FROM URBAN WATERSHEDS,
W71-06306 04C

RIMA, D. R.
SOME FACTORS TO BE CONSIDERED IN THE DESIGN OF WASTE DISPOSAL WELLS,
W71-06199 05D

RITTENHOUSE, SUZANNE
DEFORMATION OF LEE-SIDE LAMINAE IN EOLIAN DUNES,
W71-05845 02J

RITTER, W. F.
YIELD REDUCTION BY CONTROLLED FLOODING OF CORN,
W71-06152 03F

ROBERTSON, JAMES M.
TURBULENT FRICTION IN ECCENTRIC ANNULAR CONDUITS,
W71-06402 08B

ROBERTSON, W. J.
INFILTRATION IN SEWERS,
W71-06403 08A

ROBERTS, MARC J.
ORGANIZING WATER POLLUTION CONTROL THE SCOPE AND STRUCTURE OF RIVER BASIN AUTHORITIES,
W71-05936 06F

ROBERTS, R. M.
A FEASIBILITY ANALYSIS OF INCINERATOR SYSTEMS FOR RESTORATION OF OIL CONTAMINATED BEACHES,
W71-06252 05E

ROBISON, L. R.
PLANTING CORN IN NATIVE SOD,
W71-06060 03F

ROHLICH, G. A.
EFFECTS OF AGRICULTURAL POLLUTION ON EUTROPHICATION,
W71-06443 05C

ROSCOE, K. H.
THE INFLUENCE OF STRAINS IN SOIL MECHANICS,
W71-05907 08D

ROSEMAN, KARL A.
DEVELOPMENT OF PHOSPHATE-FREE HOME LAUNDRY DETERGENTS,
W71-06247 05G

ROSE, WALTER W.
WASTE REDUCTION IN FOOD CANNING OPERATIONS,
W71-06257 05D

ROSS, DAVID A.
SEDIMENTS OF THE NORTHERN MIDDLE AMERICA TRENCH,
W71-05844 02J

ROSS, J. R.
RECOVERY OF URANIUM FROM NATURAL MINE WATERS BY COUNTERCURRENT ION EXCHANGE,
W71-05841 05D

ROTH, MARTIN L.
HOW TO THINK ABOUT INSTRUMENTATION AND CONTROL,
W71-06409 05G

ROUBAL, RONALD
REPORT ON BIOLOGICAL, CHEMICAL, AND GEOLOGICAL STUDIES OF BOIS BRULE AND POPLAR RIVER WATERSHEDS,
W71-05986 05C

RUMER, RALPH R.
WIND INDUCED CIRCULATION PATTERN IN A ROTATING MODEL OF LAKE ERIE,
W71-05891 02H

RUSSELL, S. O.
USING ALL AVAILABLE HYDROLOGIC DATA,
W71-06138 07C

SIMULATING SNOWMELT HYDROGRAPHS FOR THE FRASER RIVER SYSTEM,
W71-06147 02A

SALEWSKI, K. H.
THE DISCHARGE OF STORM SEWAGE TO PUBLIC WATERS FROM AREAS OF GROUNDS WHICH ARE ENDANGERED BY OIL, IN CONNECTION WITH THE CLEAN WATER ACT FOR BERLIN,
W71-06388 05D

SANTRY, I. W.
INCREASING SEWAGE FLOW VELOCITY BY USING CHEMICAL ADDITIVES,
W71-06400 08B

SARRAF, S.
A COMPARISON OF WATER USE FOR HYBRID CORN IN THE BEKAA AND THE COASTAL PLAIN,
W71-06067 03F

SAUCIER, J. W.
DESIGN CRITERIA FOR MUNICIPAL WASTE WATER TREATMENT PLANTS IN TENNESSEE,
W71-06043 05D

SCHAERER, P. A.
VARIATION OF GROUND SNOW LOADS IN BRITISH COLUMBIA,
W71-06140 02C

SCHIFFMAN, R. L.
SETTLEMENT PROBLEM ORIENTED COMPUTER LANGUAGE,
W71-05915 08D

SCHNELLE, K. B., JR.
MOISTURE TRANSPORT IN SLUDGE DEWATERING AND DRYING ON SAND BEDS,
W71-06031 05D

SCHREIBER, DAVID L.
OPTIMIZATION TECHNIQUES FOR WATER RESOURCE SYSTEMS,
W71-06062 06A

SCHULTZE, CHARLES L.
THE ROLE OF INCENTIVES, PENALTIES, AND REWARDS IN ATTAINING EFFECTIVE POLICY,
W71-05959 06B

SCOTT, JON T.
ON THE MECHANISM OF LANGMUIR CIRCULATIONS AND THEIR ROLE IN EPILIMNION MIXING,
W71-05975 02H

JULY CURRENTS NEAR THE SOUTH SHORE OF LAKE ONTARIO,
W71-05978 02H

SCRIVNER, MANSIL W.
CANAL CAPACITY STUDIES MAIN CANAL COLUMBIA BASIN PROJECT,
W71-06109 04A

SEDOV, V. M.
THE PRESENT STATE AND PROSPECTS OF DEVELOPMENT IN RADIOACTIVE WASTE MANAGEMENT IN THE USSR,
W71-06006 05E

SELBY, M. J.
THE ORIGIN OF THE LABYRINTH, WRIGHT VALLEY, ANTARCTICA,
W71-05847 02J

SEMENENKO, V. E.
ON THE OCCURRENCE OF TRANS-3-HEXADECANOIC ACID IN CHLORELLA CELLS, (IN RUSSIAN),
W71-05989 02K

SEMPLAK, R. A.
DENSE NETWORK FOR RAPID MEASUREMENT OF RAINFALL RATE,
W71-06410 02B

SERPA, G. J.
GRAND COULE THIRD POWERPLANT NOISE CONTROL STUDY,
W71-06329 08C

SHAFFER, F. B.
A PROPOSED STREAMFLOW-DATA PROGRAM FOR NEBRASKA,
W71-06128 07A

SHAFFER, RON E.
IMPLICATIONS OF WATER QUALITY LAWS FOR THE FEEDLOT INDUSTRY,
W71-06222 05G

SHANNON, EARL E.
EUTROPHICATION CAUSE--EFFECT RELATIONSHIPS,
W71-06009 05C

SHANNON, WILLIAM G.
SNOW SURVEY TELEMETRY NETWORKS AND FUTURE PLANS,
W71-06148 07A

SHAPIRO, DAVID
THE TREATMENT OF RISK AND UNCERTAINTY,
W71-05965 06B

SHAPIRO, R. E.
THE ABSORPTION OF MERCURY FROM FOOD, ITS SIGNIFICANCE AND NEW METHODS OF REMOVING MERCURY FROM THE BODY,
W71-06080 05C

SHARMA, HARI R.
EFFICIENCY OF HYDRAULIC JUMP,
W71-05850 08B

SHARMA, P. N.
PHYSIOLOGY OF BOLL SHEDDING IN COTTON IV. CORRELATION STUDIES ON FLOWER PRODUCTION AND BOLL SHEDDING IN RELATION TO TEMPERATURE AND RAINFALL,
W71-06056 03F

SHEN, WILLIAM CHUAN
PENETRATION IN A GRADED FILTER,
W71-06151 08B

SHERIDAN, RICHARD G.
WATER, WATER EVERYWHERE---BUT A STUDY OF THE POLITICO-ADMINISTRATIVE ASPECTS OF WATER DEVELOPMENT IN MONTANA,
W71-06226 06E

SHUMWAY, DEAN L.
DISSOLVED OXYGEN CRITERIA FOR THE PROTECTION OF FISH,
W71-06182 05C

SIBLEY, THOMAS H.
SOME VARIATION IN THE QUALITY OF WATER FROM THE SOURCE AND MOUTH OF THE NIAGARA RIVER,
W71-05881 05A

SIDDIQI, B. H.
EVALUATION OF SOME STABILIZATION PONDS IN INDIA,
W71-06033 05D

SIDES, G. R.
ENGINEERING BEHAVIOR AND STRUCTURE OF COMPACTED CLAY,
W71-05908 08D

SIEVERS, HELLMUTH A.
SEASONAL VARIATIONS OF TEMPERATURE, DRIFT, AND HEAT EXCHANGE IN SURFACE WATERS OFF THE WEST COAST OF SOUTH AMERICA,
W71-06094 02L

SIGLER, W. F.
EFFECTS OF ALKYL BENZENE SULFONATE ON RAINBOW TROUT,
W71-06325 05C

SILBERMAN, E.
TEMPERATURE CONTROL IN OUTDOOR EXPERIMENTAL PONDS,
W71-06093 05C

SILVER, M. E.
THE ECOLOGY AND OCEANOGRAPHY OF SEWER OUTFALLS,
W71-05928 06G

SIMPSON, GEORGE D.
STORM WATER TREATMENT AT CLEVELAND,
W71-06389 05D

SINGH, KRISHAN P.
ECONOMIC DESIGN OF CENTRAL WATER SUPPLY SYSTEMS FOR MEDIUM SIZED TOWNS,
W71-06312 06B

SKOCH, EDWIN J.
MONTHLY VARIATION IN PHOSPHATE AND RELATED CHEMICALS FOUND IN THE SEDIMENT IN THE ISLAND AREA OF LAKE ERIE, 1967-68, WITH REFERENCE TO SAMPLES COLLECTED IN 1964, 1965, AND 1966,
W71-06187 05B

SKOGERBOE, GAYLORD V.
HYDROLOGIC INVENTORY OF THE UTAH LAKE DRAINAGE AREA,
W71-06218 02E

SKOGERBOE, GAYLORD V.
WATER RELATED LAND USE IN THE UTAH LAKE DRAINAGE AREA,
W71-06213 07C

HYDROLOGIC INVENTORY OF THE UINTAH STUDY UNIT,
W71-06219 02E

SLACK, KEITH V.
A PORTABLE MULTIPARAMETER WATER QUALITY KIT,
W71-06157 05A

SLAUGHTER, TUBBIT H.
AVAILABILITY OF GROUNDWATER IN CHARLES COUNTY, MARYLAND,
W71-06168 02F

SLEIGH, J. H., JR.
STUDY AND EXPERIMENTS IN WASTE WATER RECLAMATION BY REVERSE OSMOSIS,
W71-06025 05D

SLY, P. G.
BOTTOM SEDIMENT SAMPLING,
W71-05886 07B

SMITH, COURTLAND L.
SOCIO-CULTURAL IMPACTS OF WATER RESOURCE DEVELOPMENT IN THE SANTIAM RIVER BASIN,
W71-05921 06B

SMITH, J. D.
STUDY OF EQUIPMENT AND METHODS FOR REMOVING OR DISPERSING OIL FROM OPEN WATERS,
W71-06106 05G

SMITH, LLOYD L., JR.
SOME FACTORS INFLUENCING TOXICITY OF LINEAR ALKYLATE SULFONATE (LAS) TO THE BLUEGILL,
W71-06260 05C

SMITH, LORRAINE
MODIFIED TRENCHER SLICES THROUGH FLINT-HARD ROCK,
W71-06411 08E

SMITH, WILLIAM G.
SEDIMENTATION IN A MALAYSIAN HIGH TIDE TROPICAL DELTA,
W71-05858 02J

SOARSBROOK, C. E.
EFFECT OF IRRIGATION ON RECOVERY OF APPLIED NITROGEN BY COTTON,
W71-06216 03F

SOLOMON, MARTIN B.
UNCERTAINTY AND ITS EFFECT ON CAPITAL INVESTMENT ANALYSIS,
W71-05954 06B

SONDEREGGER, JOHN L.
HYDROLOGY OF LIMESTONE TERRANES, PHOTOGEOLOGIC INVESTIGATIONS,
W71-05838 02F

SORENSEN, R. C.
HOW TO SELECT AND APPLY ZINC FERTILIZER,
W71-06059 03F

SPAIN, JAMES D.
THE USE OF CONCENTRATIONS OF ELECTROLYTES AND NATURALLY FLUORESCENT MATERIALS TO STUDY WATER MASS MOVEMENTS IN A FRESHWATER 'ESTUARY',
W71-05877 02L

SPEECE, R. E.
TREATMENT OF FISH HATCHERY EFFLUENT FOR RECYCLE,
W71-06024 05D

SPIEGLER, K. S.
STUDY OF MASS TRANSFER IN MEMBRANE PROCESSES,
W71-06233 03A

SPIEWAK, I.
SURVEY OF DESALTING PROCESSES FOR USE IN WASTE WATER TREATMENT,
W71-06042 05D

W71-06268 05D

SPOFFARD, WALTER
ENVIRONMENTAL QUALITY MANAGEMENT,
W71-05941 06B

SPOOR, W. A.
AN ELECTRODE CHAMBER FOR RECORDING RESPIRATORY AND OTHER MOVEMENTS OF FREE-SWIMMING ANIMALS,
W71-06328 05A

SPORNS, U.
SNOW AND RESERVOIR MANAGEMENT IN CANADA FOR THE COLUMBIA RIVER TREATY OPERATION,
W71-06134 02C

STEFAN, H.
TEMPERATURE CONTROL IN OUTDOOR EXPERIMENTAL PONDS,
W71-06093 05C

STEINBERG, M.
TREATMENT OF ACID MINE DRAINAGE BY OZONE OXIDATION,
W71-06250 04D

STEINHILBER, W. L.
AVAILABILITY OF GROUNDWATER IN DECATUR COUNTY, IOWA,
W71-06175 02F

STEPHENS, J. W.
WELL RECORDS, DEPTH-TO-WATER MEASUREMENTS, CHEMICAL ANALYSES OF GROUND WATER, DRILLERS LOGS, AND ELECTRIC-LOG INFORMATION IN HEMPSTEAD, LAFAYETTE, LITTLE RIVER, MILLER, AND NEVADA COUNTIES, ARKANSAS,
W71-06229 04B

STETHERS, HOWARD
PHOSPHATE REMOVAL FORM TERTIARY EFFLUENT WITH ION EXCHANGE MATERIALS,
W71-05926 05D

STEVENSON, F. J.
CHEMISTRY OF NITROGEN IN SOILS,
W71-06436 05B

STEVENS, DONALD B.
THERMAL CRITERIA - A MEASURE TO CONTROL THERMAL POLLUTION,
W71-06096 05C

STEWART, K. M.

SOME VARIATION IN THE QUALITY OF WATER FROM THE SOURCE AND MOUTH OF THE NIAGARA RIVER,
W71-05881 05A

STEWART, RONALD
ON THE MECHANISM OF LANGMUIR CIRCULATIONS AND THEIR ROLE IN EPILIMNION MIXING,
W71-05975 02H

STIEGLITZ, RONALD D.
A STUDY OF FRESHWATER SAND GRAIN SURFACES BY SCANNING ELECT RON MICROSCOPY,
W71-05887 07B

STOERMER, E. F.
PLANKTON DIATOM ASSEMBLAGES IN LAKE MICHIGAN,
W71-05984 05C

STONE, JAMES H.
METHANOL REQUIREMENT AND TEMPERATURE EFFECTS IN WASTE WATER DENITRIFICATION,
W71-06246 05D

STONE, RALPH
SPECIAL STUDIES OF A SANITARY LANDFILL,
W71-06103 05B

STUART, LESLIE B.
DEVELOPMENT OF DESIGN PARAMETERS FOR INTERSTATE REST AREA SEWAGE TREATMENT SYSTEMS,
W71-06040 05D

STURM, EDWARD
SUBAQUEOUS SLUMP STRUCTURES,
W71-05848 02J

STUTHMANN, M. G.
A PROPOSED STREAMFLOW-DATA PROGRAM FOR NEBRASKA,
W71-06128 07A

SUEISHI, T.
EXPERIMENTAL ESTIMATION OF DETENTION IN STORM SEWER SYSTEM,
W71-06404 08B

SUESS, M. J.
THE OCCURRENCE OF POLYCYCLIC AROMATIC CARBOHYDRATES IN COASTAL WATERS AND ITS POSSIBLE EFFECTS ON MAN'S HEALTH (IN GERMAN),
W71-06207 05C

SUNDARAM, T. R.
THE EFFECTS OF THERMAL DISCHARGES ON THE STRATIFICATION CYCLE OF LAKES,
W71-06082 05C

SUTHERLAND, E. R.
CONTROL OF WASTES FROM WATER TREATMENT PLANTS,
W71-06200 05D

SUTHERLAND, JEFFREY C.
GEOCHEMICAL SYSTEMS IN ONONDAGA LAKE (CENTRAL NEW YORK STATE) COMPARED WITH THE GREAT LAKES,
W71-05888 02H

SWEENY, KEITH H.
INVESTIGATION OF MEANS FOR CONTROLLED SELF-DESTRUCTION OF PESTICIDES,
W71-06249 05G

SWEERS, H. E.
REMOVAL OF CONTAMINANTS FROM LAKE ONTARIO BY NATURAL PROCESSES,
W71-05878 05G

VERTICAL DIFFUSIVITY COEFFICIENT IN A THERMOCLINE,
W71-06088 02H

SYNOWIEC, A.
SUMMER THERMAL STRUCTURE AND CIRCULATION OF CHEQUAMEGON BAY, LAKE SUPERIOR--A FLUCTUATING SYSTEM,
W71-05885 02H

TAKEUCHI, TADAO
BIOLOGICAL REACTIONS AND PATHOLOGICAL CHANGES OF HUMAN BEINGS AND ANIMALS UNDER THE CONDITION OF ORGANIC MERCURY CONTAMINATION,
W71-06076 05C

TALBOT, R. S.
REACTION RATES OF PHOTOSYNTHESIS,
W71-06039 05C

TASSIGNY, M.
INVESTIGATIONS OF THE TECHNIQUES OF PURIFICATION OF ALGAL CULTURES ELABORATION OF METHODS APPLICABLE TO DESMIDS, FILAMENTOUS CYANOPHYTES, AND DIATOMS, (IN FRENCH),
W71-06002 07B

TAYLOR, GEORGE S.
COMPUTER METHODS FOR TRANSIENT ANALYSIS OF WATER-TABLE AQUIFERS,
W71-05920 02F

THOMAS, RICHARD F.
POTENTIAL FOR STREAMFLOW AUGMENTATION BY GROUNDWATER PUMPING,
W71-06118 04B

THOMAS, RICHARD L.
THE QUALITATIVE DISTRIBUTION OF FELDSPARS IN SURFICIAL BOTTOM SEDIMENTS FROM LAKE ONTARIO,
W71-05889 02J

THOM, H. C. S.
DEVELOPMENT OF SNOW LOAD DESIGN DATA FOR THE UNITED STATES,
W71-06141 02C

TIBBS, NICHOLAS H.
POLLUTION FROM MINES IN THE 'NEW LEAD BELT' OF SOUTH EASTERN MISSOURI,
W71-05837 05A

TIFFANY, MARY A.
SURFACE WATER INPUTS OF IODINE, BROMINE, AND CHLORINE TO LAKE HURON,
W71-05882 05B

TILT, P. A.
EFFECTS OF IRRIGATION INTENSITY AND NITROGEN LEVEL ON THE PERFORMANCE OF EIGHT VARIETIES OF UPLAND COTTON, GOSSPYIUM HIRSUTUM L.,
W71-06068 03F

TIMMONS, D. R.
CHEMISTRY OF SEDIMENT IN WATER,
W71-06431 05B

TIMMONS, F. L.
HERBICIDE RESIDUES IN AGRICULTURAL WATER FROM CONTROL OF AQUATIC AND BANK WEEDS,
W71-06440 05B

TIMMONS, JOHN F.
ECONOMIC ASPECTS,
W71-06447 05G

TOMLINSON, H. D.
HYDRAULIC OVERLOADING-FACT OR FICTION,
W71-06198 05D

TOWNLEY, NEAL
STUDIES ON THE CHEMICAL CONTROL OF TREE ROOTS IN SEWER LINES,
W71-06397 04A

TRACHTENBERG, ISAAC
ION-SELECTIVE ELECTROCHEMICAL SENSORS,
W71-06239 03A

TRACHTENBERG, ISSAC
ION-SELECTIVE ELECTROCHEMICAL SENSORS - SECOND REPORT,
W71-06240 03A

TRAMS, EBERHARD G.
METABOLISM OF QUINALDINE(2-METHYL-QUINOLINE). UPTAKE AND EXCRETION BY NURSE SHARKS,
W71-06324 05C

TRAVIS, DAVID O.
EFFECT OF FEEDLOT LAGOON WATER ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF SOILS,
W71-05974 05C

TROCK, WARREN L.
INSTITUTIONAL FACTORS INFLUENCING WATER DEVELOPMENT IN TEXAS,
W71-05972 06B

TROSHANOV, E. P.
CONDITIONS AFFECTING THE REDUCTION OF IRON AND MANGANESE BY BACTERIA IN THE ORE-BEARING LAKES OF THE KARELIAN ISTHMUS,
W71-05993 02K

VAIDYARAMAN, P.
TEMPERATURE CONTROL IN OUTDOOR EXPERIMENTAL PONDS,
W71-06093 05C

VAN DENBURGH, A. S.
WATER-RESOURCES APPRAISAL OF THE COLUMBUS SALT MARSH-SODA SPRING VALLEY AREA, MINERAL AND ESMERALDA COUNTIES, NEVADA,
W71-05862 04B

VAN HORNE, JAMES C.
A NOTE ON BIASES IN CAPITAL BUDGETING INTRODUCED BY INFLATION,
W71-05969 06C

VANCE, GEORGE P.
A STUDY OF THE BEHAVIOR OF OIL SPILLS IN THE ARCTIC,
W71-06101 05B

VARMA, M. M.
REACTION RATES OF PHOTOSYNTHESIS,
W71-06039 05C

VEITH, GILMAN D.
WATER CHEMISTRY OF TOXAPHENE - ROLE OF LAKE SEDIMENTS,
W71-05840 05B

VERDUIN, JACOB
SIGNIFICANCE OF PHOSPHORUS IN WATER SUPPLIES,
W71-06433 05B

VERESHCHAGIN, A. G.
ON THE OCCURRENCE OF TRANS-3-HEXADECANOIC ACID IN CHLORELLA CELLS, (IN RUSSIAN),
W71-05989 02K

VERNBERG, F. JOHN
THE INFLUENCE OF ACCLIMATION TEMPERATURE ON THE LIPID COMPOSITION OF FISH GILL MITOCHONDRIA,
W71-06321 05C

VESILIND, P. A.
PRACTICAL HYDRAULICS FOR PUBLIC WORKS ENGINEER,
W71-06398 08B

VIGIER, G.
STABILITY OF ROCK SLOPES--GRAPHICAL METHODS,
W71-05909 02E

VOEGELI, PAUL T., SR.
RADIOCHEMICAL ANALYSES OF WATER FROM SELECTED STREAMS, WELLS, SPRINGS, AND PRECIPITATION COLLECTED PRIOR TO REENTRY DRILLING, PROJECT RULISON,
W71-05842 05A

VOSSBRINGER, R.
STABILITY OF ROCK SLOPES--GRAPHICAL METHODS,
W71-05909 02E

WAANANEN, ARVI O.
FLOODS FROM SMALL DRAINAGE AREAS IN CALIFORNIA-A COMPILATION OF PEAK DATA OCTOBER 1958 TO SEPTEMBER 1969,
W71-06127 07C

WADLEIGH, CECIL H.
INTRODUCTION ISSUES IN FOOD PRODUCTION AND CLEAN WATER,
W71-06429 05G

WAGNER, G. H.
CHEMISTRY OF NITROGEN IN SOILS,
W71-06436 05B

WAIDE, C.
TREATMENT OF ACID MINE DRAINAGE BY OZONE OXIDATION,
W71-06250 04D

WAISEL, Y.
ENVIRONMENTAL EFFECTS ON WOOD PRODUCTION AND CAMBIAL ACTIVITY IN ZIZIPHUS SPINACHRISTI (L.) WILLD.,
W71-06214 02I

WALDICHUCK, MICHAEL
EUTROPHICATION STUDIES OF A SHALLOW INLET ON VANCOUVER ISLAND,
W71-05988 02L

WALKUP, P. C.
STUDY OF EQUIPMENT AND METHODS FOR REMOVING OR DISPERSING OIL FROM OPEN WATERS,
W71-06106 05G

WALLER, D. H.
ALTERNATIVES TO SEPARATION OF COMBINED SEWERS,
W71-06374 05D

WALTHER, ERIC G.
ON THE MECHANISM OF LANGMUIR CIRCULATIONS AND THEIR ROLE IN EPILIMNION MIXING,
W71-05975 02H

WARNER, R. R.
THE ECOLOGY AND OCEANOGRAPHY OF SEWER OUTFALLS,
W71-05928 06G

WARWICK, WILLIAM J.
SOME THOUGHTS ON SEWER PIPE BEDDING,
W71-06412 08A

WASMER, VON HANS R.
SOLID WASTE DEPOSITION AND WATER PROTECTION (IN GERMAN),
W71-06210 05E

WATTERS, GARY Z.
HYDRODYNAMIC EFFECTS OF SEEPAGE ON BED PARTICLES,
W71-05839 02J

WEDDLE, CLARK L.
FE CL3 ADDITION EXPERIMENTS FOR IMPROVED EFFLUENT QUALITY AT THE CALUMET TREATMENT PLANT, INTERIM REPORT,
W71-05927 05D

WEDIN, W. F.
ESTABLISHMENT OF PERENNIAL FORAGES I. SUBSEQUENT YIELDS II. SUBSEQUENT ROOT DEVELOPMENT,
W71-06215 03F

WEIDENBAUM, MURRAY L.
INSTITUTIONAL OBSTACLES TO REALLOCATING GOVERNMENT EXPENDITURES,
W71-05961 06B

WEILER, R. R.
DISSOLVED MINERAL QUALITY OF GREAT LAKES WATERS,
W71-05883 05A

WEIR, J. E., JR.
GEOHYDROLOGY OF THE AREA NEAR WOSCO EXPLORATORY HOLE NUMBER 1, UINTAH COUNTY, UTAH,
W71-06153 08H

WEISBROD, BURTON A.
COLLECTIVE ACTION AND THE DISTRIBUTION OF INCOME A CONCEPTUAL APPROACH,
W71-05960 06C

WEIDER, GEORGE E.
GROUNDWATER RECONNAISSANCE OF THE GREEN RIVER BASIN, SOUTHWESTERN WYOMING,
W71-05902 07C

WENDELL, CLIFFORD
LOW COST STORM DRAINAGE WITH PAVED CHANNELS,
W71-06413 08F

WENGERT, NORMAN
PUBLIC PARTICIPATION IN WATER PLANNING A CRITIQUE OF THEORY, DOCTRINE, AND PRACTICE,
W71-06315 06B

WEST, A. W.
CASE HISTORIES IMPROVED ACTIVATED SLUDGE PLANT PERFORMANCE BY OPERATIONS CONTROL,
W71-06201 05D

WEST, P. J.
COOLING WATER RESOURCES AND POWER GENERATION,
W71-06091 05G

WHETSTONE, GEORGE A.
INTERBASIN DIVERSION OF WATER AN ANNOTATED BIBLIOGRAPHY,
W71-06071 07C

WHITE, R. H.
TV INSPECTION AND IN-PLACE GROUTING OF SEWERS,
W71-06427 07B

WHITE, WILLIAM RODNEY
FLAT-VEE WEIRS IN ALLUVIAL CHANNELS,
W71-05849 08B

WHITFIELD, M.
EH AS AN OPERATIONAL PARAMETER IN ESTUARINE STUDIES,
W71-05873 02L

WHITLEY, JAMES R.
EFFECTS OF AGRICULTURAL POLLUTANTS ON RECREATIONAL USES OF SURFACE WATERS,
W71-06444 05C

WHITMAN, R. V.
SETTLEMENT PROBLEM ORIENTED COMPUTER LANGUAGE,
W71-05915 08D

WHITTEMORE, RAYMOND C.
INDUCED AIR MIXING OF LARGE BODIES OF POLLUTED WATER,
W71-06245 05G

WHITTON, B. A.
TOXICITY OF ZINC, COPPER AND LEAD TO CHLOROPHYTA FROM FLOWING WATERS,
W71-05991 05C

WIEGAND, C. L.
WATER USE BY COTTON FROM LOW AND MODERATELY SALINE STATIC WATER TABLES,
W71-06221 03C

WILDAVSKY, AARON
RESCUING POLICY ANALYSIS FROM PPBS,
W71-05968 06B

WILLARD, WILLIAM B., JR.
A STUDY OF MUNICIPAL WASTE WATER RECLAMATION,
W71-06041 05D

WILLIAMS, ERNEST T., JR.
OPTIMIZING WASTE TREATMENT CONTROL SYSTEMS,
W71-06414 05D

WILLIAMS, F. A.
BOUNDARY LAYER FLOW PROBLEMS IN DESALINATION BY REVERSE OSMOSIS,
W71-06237 03A

WILSON, A. T.
THE ORIGIN OF THE LABYRINTH, WRIGHT VALLEY, ANTARCTICA,
W71-05847 02J

WILSON, DENNIS C.
THE EFFECTS OF THE HERBICIDES DIQUAT AND DICHLOBENIL (CASORON) ON POND INVERTEBRATES PART I. ACUTE TOXICITY,
W71-06181 05C

WINCHESTER, JOHN W.
SURFACE WATER INPUTS OF IODINE, BROMINE, AND CHLORINE TO LAKE HURON,
W71-05882 05B

WINDSOR, JAMES. S.
A PROGRAMMING MODEL FOR FARM IRRIGATION SYSTEMS,
W71-05923 03F

WISSMAR, ROBERT C.
SOME EFFECTS OF ANTIMYCIN IN AN OLIGOTROPHIC LAKE,
W71-06323 05C

WIXSON, BOBBY G.
POLLUTION FROM MINES IN THE 'NEW LEAD BELT' OF SOUTH EASTERN MISSOURI,
W71-05837 05A

WOFFINDEN, DURAD S.
WATER QUALITY TELEMETRY FINAL PROGRESS REPORT,
W71-06069 05G

WOLMAN, ABEL
PROVIDING REASONABLE WATER SERVICE,
W71-05942 06D

75 YEARS OF IMPROVEMENT IN WATER SUPPLY QUALITY,
W71-05943 06E

WOODARD, THOMAS H.
SUMMARY OF DATA ON TEMPERATURE OF STREAMS IN NORTH CAROLINA, 1943-67,
W71-05855 07C

WOODROW, DONALD L.
GEOLOGICAL, CHEMICAL, AND PHYSICAL ATTRIBUTES OF SEDIMENTS IN SENECA LAKE, NEW YORK,
W71-05890 02J

WOODS, WILLIAM J.
BENTHIC PRODUCTIVITY,
W71-06020 02L

WOOD, F.
METHOD OF AND MEANS FOR DEALING WITH STORM-WATER OVERFLOWS IN SEWERS AND LIKE DRAINAGE SYSTEMS,
W71-06375 08B

WOOSTER, WARREN S.
SEASONAL VARIATIONS OF TEMPERATURE, DRIFT, AND HEAT EXCHANGE IN SURFACE WATERS OFF THE WEST COAST OF SOUTH AMERICA,
W71-06094 02L

WYCKOFF, J. B.
MEASURING INTANGIBLE BENEFITS--SOME NEEDED RESEARCH,
W71-06313 06B

YAMANAGA, GEORGE
PRELIMINARY REPORT ON THE WATER RESOURCES OF THE WAILUKU AREA,
W71-06155 02E

YANG, J. J.
PLANKTON DIATOM ASSEMBLAGES IN LAKE MICHIGAN,
W71-05984 05C

YANKO, JAMES M.
THE USE OF CONCENTRATIONS OF ELECTROLYTES AND NATURALLY FLUORESCENT MATERIALS TO STUDY WATER MASS MOVEMENTS IN A FRESHWATER 'ESTUARY',
W71-05877 02L

YOUNGSTEADT, NORMAN W.
PLANKTON REDUCTION IN THE REVERSED FLOW WATERWAYS OF THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO,
W71-05924 05B

YOUNG, ROBERT A.
SAFE YIELD OF AQUIFERS AN ECONOMIC REFORMULATION,
W71-06126 06B

ZEMANEK, J.
FORMATION EVALUATION BY INSPECTION WITH THE BOREHOLE TELEVIEWER,
W71-05916 07B

ZIEMINSKI, STEFAN A.
INDUCED AIR MIXING OF LARGE BODIES OF POLLUTED WATER,
W71-06245 05G

ORGANIZATIONAL INDEX

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, PA.
BIOLOGICAL CONCEPTS AND INDUSTRIAL WASTE DISPOSAL PROBLEMS,
W71-06038 05D

EFFECTS OF ALKYL BENZENE SULFONATE ON BREEDING BEHAVIOR OF FLAGFISHES, JORDANELLA FLORIDAE,
W71-06184 05C

ADVANCED WASTE RESEARCH PROGRAM, CINCINNATI, OHIO.
ULTIMATE DISPOSAL OF INDUSTRIAL WASTE AN OVERVIEW,
W71-06259 05E

AEROJET-GENERAL CORP., EL MONTE, CALIF. ENVIRONMENTAL SYSTEMS DIV.
INVESTIGATION OF MEANS FOR CONTROLLED SELF-DESTRUCTION OF PESTICIDES,
W71-06249 05G

AGENCY FOR INTERNATIONAL DEVELOPMENT, WASHINGTON, D.C. OFFICE OF HUMAN RESOURCES AND SOCIAL DEVELOPMENT.
WATER AND MAN'S HEALTH,
W71-06108 05F

AGRICULTURAL RESEARCH INST., TAL-AMARA (LEBANON). DEPT. OF IRRIGATION.
A COMPARISON OF WATER USE FOR HYBRID CORN IN THE BEKAA AND THE COASTAL PLAIN,
W71-06067 03F

AGRICULTURAL RESEARCH SERVICE, BELTSVILLE, MD. WATER CONSERVATION RESEARCH DIV.
INTRODUCTION ISSUES IN FOOD PRODUCTION AND CLEAN WATER,
W71-06429 05G

AGRICULTURAL RESEARCH SERVICE, DENVER, COLO. CROP RESEARCH DIV AND AGRICULTURAL RESEARCH SERVICE, LARAMIE, WYO. CROPS RESEARCH DIV.
HERBICIDE RESIDUES IN AGRICULTURAL WATER FROM CONTROL OF AQUATIC AND BANK WEEDS,
W71-06440 05B

AGRICULTURAL RESEARCH SERVICE, MORRIS, MINN. SOIL AND WATER CONSERVATION RESEARCH DIV AND MINNESOTA AGRICULTURAL EXPERIMENT STATION, ST. PAUL.
CHEMISTRY OF SEDIMENT IN WATER,
W71-06431 05B

AGRICULTURAL RESEARCH SERVICE, THORSBY, ALA. SOIL AND WATER CONSERVATION RESEARCH DIV. AND AUBURN UNIV., ALA. DEPT. OF SOILS.
EFFECT OF IRRIGATION ON RECOVERY OF APPLIED NITROGEN BY COTTON,
W71-06216 03F

AGRICULTURAL RESEARCH SERVICE, WESLACO, TEX., AND TEXAS AGRICULTURAL EXPERIMENT STATION, COLLEGE STATION.
WATER USE BY COTTON FROM LOW AND MODERATELY SALINE STATIC WATER TABLES,
W71-06221 03C

AKADEMIYA NAUK SSSR, LENINGRAD. INSTITUT TSITOLOGII.
CONDITIONS AFFECTING THE REDUCTION OF IRON AND MANGANESE BY BACTERIA IN THE ORE-BEARING LAKES OF THE KARELIAN ISTHMUS,
W71-05993 02K

AKADEMIYA NAUK SSSR, MOSCOW. INST. OF PLANT PHYSIOLOGY.
ON THE OCCURRENCE OF TRANS-3-HEXADECANOIC ACID IN CHLORELLA CELLS, (IN RUSSIAN),
W71-05989 02K

AMERICAN ELECTRIC POWER SERVICE CORP., NEW YORK.
INITIAL EXPERIENCES ON THE 765 KV SYSTEM OF THE AMERICAN ELECTRIC POWER COMPANY (USA),
W71-05913 08C

AMERICAN WATER WORKS ASSOCIATION, NEW YORK.
PROVIDING REASONABLE WATER SERVICE,
W71-05942 06D

75 YEARS OF IMPROVEMENT IN WATER SUPPLY QUALITY,
W71-05943 06E

ARIZONA AGRICULTURAL EXPERIMENT STATION, MESA.
SEED TABLETS FOR PRECISION PLANTING LETTUCE,
W71-06224 03F

ARIZONA AGRICULTURAL EXPERIMENT STATION, TUCSON.
USE ANIMAL MANURE EFFECTIVELY,
W71-06454 05D

ARIZONA AGRICULTURAL EXPERIMENT STATION, YUMA.
EFFECTS OF IRRIGATION INTENSITY AND NITROGEN LEVEL ON THE PERFORMANCE OF EIGHT VARIETIES OF UPLAND COTTON, GOSSPYIUM HIRSUTUM L.,
W71-06068 03F

ARIZONA UNIV., TUCSON. DEPT. OF WATERSHED MANAGEMENT AND ARIZONA AGRICULTURAL EXPERIMENT STATION, TUCSON.
THE SAN SIMON WATERSHED REVEGETATION,
W71-06223 04D

ARIZONA UNIV., TUCSON. DEPT. OF WATERSHED MANAGEMENT AND ARIZONA UNIV., TUCSON. DEPT. OF RANGE MANAGEMENT.
PINYON-JUNIPER CONTROL WHERE. WHY,
W71-06225 04D

ARIZONA UNIV., TUCSON. TREE-RING RESEARCH LAB. AND WISCONSIN UNIV., MADISON. CLIMATIC RESEARCH CENTER AND VIRGINIA UNIV., CHARLOTTESVILLE. DEPT. OF ENVIRONMENTAL SCIENCE.
MULTIVARIATE TECHNIQUES FOR SPECIFYING TREE-GROWTH AND CLIMATE RELATIONSHIPS AND FOR RECONSTRUCTING ANOMALIES IN PALEOCLIMATE,
W71-05851 02B

ARIZONA UNIV., TUSCON. DEPT. OF HYDROLOGY AND WATER RESOURCES.
OPERATIONS RESEARCH STUDY OF WATER RESOURCES - PART II,
W71-06307 06A

ARKANSAS UNIV., FAYETTEVILLE RESOURCES RESEARCH CENTER.
DISTRIBUTION OF TRACE METALS IN IMPOUNDMENTS,
W71-05971 05B

ARKANSAS UNIV., FAYETTEVILLE.
TEMPERATURE SELECTION AND HEAT RESISTANCE OF THE MOSQUITO FISH, GAMBUSIA AFFINIS,
W71-06180 05C

ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER, CHARLOTTESVILLE, VA.
REGENERATION OF THE SEVAN,
W71-06330 02H

ATOMIC ENERGY COMMISSION, WASHINGTON, D.C.
CONTROL OF RELEASES OF RADIOACTIVITY TO THE ENVIRONMENT.
W71-06051 05G

AUSTRALIAN ATOMIC ENERGY COMMISSION RESEARCH ESTABLISHMENT, LUCAS HEIGHTS.
RADIATION TREATMENT OF SEWAGE,
W71-06271 05D

BATTELLE MEMORIAL INST., RICHLAND, WASH. PACIFIC NORTHWEST LABS.
STUDY OF EQUIPMENT AND METHODS FOR REMOVING OR DISPERSING OIL FROM OPEN WATERS,
W71-06106 05G

BECHTEL CORP., SAN FRANCISCO, CALIF.
ECONOMICS OF COMBINING DISTILLED SEAWATER AND RENOVATED WASTE WATER AS A NEW SOURCE OF MUNICIPAL WATER SUPPLY,
W71-06238 03A

BLACK, SIVALLS AND BRYSON, INC., PITTSBURGH, PA. APPLIED TECHNOLOGY DIV.
CARBONATE BONDING OF COAL REFUSE,
W71-06256 05G

BOWDOIN COLL., BRUNSWICK, MAINE AND WISCONSIN UNIV., MADISON.
WATER POLLUTION CONTROL, RIVER BASIN AUTHORITIES AND ECONOMIC INCENTIVES SOME CURRENT POLICY ISSUES,
W71-05937 06B

BOWDOIN COLL., BRUNSWICK, MAINE.
PROJECT DESIGN AND EVALUATION WITH MULTIPLE OBJECTIVES,
W71-05962 06B

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY, VANCOUVER, CANADA, HYDROLOGY BRANCH.
SNOW AND RESERVOIR MANAGEMENT IN CANADA FOR THE COLUMBIA RIVER TREATY OPERATION,
W71-06134 02C

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF CIVIL ENGINEERING.
LABORATORY SIMULATION OF SNOWMELT,
W71-06139 02C

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF CIVIL ENGINEERING AND BRITISH COLUMBIA UNIV., VANCOUVER. WATER RESOURCES GROUP.
SIMULATING SNOWMELT HYDROGRAPHS FOR THE FRASER RIVER SYSTEM,
W71-06147 02A

BRITISH COLUMBIA UNIV., VANCOUVER. INST. OF OCEANOGRAPHY.
SMALL-SCALE MODEL OF THE 'THERMAL BAR',
W71-05895 02H

BRITISH COLUMBIA WATER RESOURCES SERVICE, VANCOUVER AND BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF CIVIL ENGINEERING.
USING ALL AVAILABLE HYDROLOGIC DATA,
W71-06138 07C

BRITISH COLUMBIA WATER RESOURCES SERVICE, VANCOUVER. HYDROLOGY DIV.
SNOW COURSE WEIGHTING PROCEDURE,
W71-06146 07C

BROOKHAVEN NATIONAL LAB., UPTON, N.Y.
TREATMENT OF ACID MINE DRAINAGE BY OZONE OXIDATION,
W71-06250 04D

BROOKINGS INSTITUTION, WASHINGTON, D.C.
THE ROLE OF INCENTIVES, PENALTIES, AND REWARDS IN ATTAINING EFFECTIVE POLICY,
W71-05959 06B

BROOKLYN COLL., N.Y. DEPT. OF GEOLOGY.
SUBAQUEOUS SLUMP STRUCTURES,
W71-05848 02J

BUREAU OF MINES, SALT LAKE CITY, UTAH. SALT LAKE CITY METALLURGY RESEARCH CENTER.
RECOVERY OF URANIUM FROM NATURAL MINE WATERS BY COUNTERCURRENT ION EXCHANGE,
W71-05841 05D

BUREAU OF RECLAMATION, DENVER, COLO. ENGINEERING AND RESEARCH CENTER.
GRAND COULE THIRD POWERPLANT NOISE CONTROL STUDY,
W71-06329 08C

BUREAU OF RECLAMATION, DENVER, COLO. OFFICE OF CHIEF ENGINEER.
ALGAECIDAL EVALUATION AND ENVIRONMENTAL STUDY OF MAT PRODUCING BLUEGREEN ALGAE,
W71-06102 04A

CANAL CAPACITY STUDIES MAIN CANAL COLUMBIA BASIN PROJECT,
W71-06109 04A

BUREAU OF RECLAMATION, WASHINGTON, D.C.
THE BUREAU OF RECLAMATION'S ROLE IN AMERICA'S GROWTH,
W71-06308 06E

BUREAU OF SPORT FISHERIES AND WILDLIFE, STUTTGART, ARK. FISH FARMING EXPERIMENT STATION.
A POTENTIAL CONTROL FOR LEECHES,
W71-06322 05C

BUSINESS AND DEFENSE SERVICE ADMINISTRATION, WASHINGTON, D.C. WATER RESOURCES AND ENGINEERING SERVICE DIV.
WATER REQUIREMENTS FOR MANUFACTURING,
W71-06318 06D

BUSINESS AND DEFENSE SERVICE ADMINISTRATION, WASHINGTON, D.C. WATER RESOURCES AND ENGINEERING DIV.
WATER USE BY APPALACHIAN MANUFACTURERS,
W71-06319 06D

CALIFORNIA INST. OF TECH, PASADENA.
MARINE WASTE DISPOSAL AND SEA URCHIN ECOLOGY,
W71-06262 05C

CALIFORNIA STATE COLL., LONG BEACH AND CALIFORNIA UNIV., LOS ANGELES.
TURBULENT DISPERSION IN POROUS MATERIALS AS MODELED BY A MIXING CELL WITH STAGNANT ZONE,
W71-06122 02F

CALIFORNIA UNIV., BERKELEY.
RESCUING POLICY ANALYSIS FROM PPBS,
W71-05968 06B

CALIFORNIA UNIV., BERKELEY. SCHOOL OF PUBLIC HEALTH.
TREATMENT OF ORGANIC INDUSTRIAL WASTES BY LAGOONING,
W71-06036 05D

CALIFORNIA UNIV., BERKELEY. SEA WATER CONVERSION LAB.
STUDY OF MASS TRANSFER IN MEMBRANE PROCESSES,
W71-06233 03A

CALIFORNIA UNIV., DAVIS.
SHEARING EFFECTS ON SETTLING OF ACTIVATED SLUDGE,
W71-06029 05D

EFFECT OF SOIL TEMPERATURE ON THE AVAILABILITY OF PHOSPHORUS IN ANIMAL MANURES,
W71-06455 05C

CALIFORNIA UNIV., LOS ANGELES.
THE TREATMENT OF RISK AND UNCERTAINTY,
W71-05965 06B

CALIFORNIA UNIV., LOS ANGELES. DEPT OF ZOOLOGY.
THE ROLE OF SUCCULENT HALOPHYTES IN THE WATER BALANCE OF SALT MARSH RODENTS,
W71-06073 02I

CALIFORNIA UNIV., LOS ANGELES. WATER RESOURCES CENTER.
PACIFIC OCEAN INFLUENCE UPON CALIFORNIA RAINFALL,
W71-06115 02B

CALIFORNIA UNIV., SAN DIEGO. DEPT. OF AEROSPACE AND MECHANICAL ENGINEERING SCIENCES.
BOUNDARY LAYER FLOW PROBLEMS IN DESALINATION BY REVERSE OSMOSIS,
W71-06237 03A

CAMBRIDGE UNIV. (ENGLAND).
EXPERIMENTAL AND THEORETICAL INVESTIGATIONS OF A PASSIVE EARTH PRESSURE PROBLEM,
W71-05919 08D

CAMBRIDGE UNIV. (ENGLAND).
THE INFLUENCE OF STRAINS IN SOIL MECHANICS,
W71-05907 08D

CANADA CENTER FOR INLAND WATERS. DEPARTMENT OF ENERGY, MINES AND RESOURCES, BURLINGTON (ONTARIO).
LARGE-SCALE DIFFUSION STUDIES AT NIAGARA RIVER MOUTH, LAKE ONTARIO,
W71-05901 07B

CANADIAN OCEANOGRAPHIC DATA CENTRE, OTTAWA (ONTARIO).
REMOVAL OF CONTAMINANTS FROM LAKE ONTARIO BY NATURAL PROCESSES,
W71-05878 05G

CASE WESTERN RESERVE UNIV., CLEVELAND, OHIO. DEPT. OF SYSTEMS ENGINEERING.
MODELING AND CONTROL OF THE POLLUTION OF WATER RESOURCES SYSTEMS VIA MULTILEVEL APPROACH,
W71-06311 06A

CATALYTIC CONSTRUCTION CO., PHILADELPHIA, PA.
FIRST ANNUAL REPORT - OPERATION OF THE MULTI-EFFECT MULTI-STAGE FLASH DISTILLATION PLANT (CLAIR ENGLE), SAN DIEGO, CALIFORNIA.
W71-06241 03A

SECOND ANNUAL REPORT - OPERATION OF THE MULTI-EFFECT MULTI-STAGE FLASH DISTILLATION PLANT (CLAIR ENGLE), SAN DIEGO, CALIFORNIA.
W71-06242 03A

CENTRAL INLAND FISHERIES RESEARCH INST., ALLAHABAD (INDIA).
OBSERVATIONS ON FLUCTUATIONS IN THE ABUNDANCE OF PLANKTON IN RELATION TO CERTAIN HYDROLOGICAL CONDITIONS OF RIVER GANGA,
W71-06004 02I

CENTRAL PUBLIC HEALTH ENGINEERING RESEARCH INST., NAGPUR (INDIA).
EVALUATION OF SOME STABILIZATION PONDS IN INDIA,
W71-06033 05D

CENTRE DE RECHERCHES DU SERVICE DE SANTE DES ARMEES, PARIS (FRANCE). DIVISION DE BIOLOGIE GENERALE ET ECOLOGIE.
POLLUTION, BY BIOSYNTHESIS 'IN SITU' OF CARCINOGENOUS HYDROCARBONS, OF A LAGOON BIOCENOSIS 'IN VITRO' REPRODUCTION OF THIS PHENOMENON (IN FRENCH),
W71-06209 05B

CENTRE D'ETUDES ET DE RECHERCHES DE BIOLOGIE ET D'OCEANOGRAPHIE MEDICALE, NICE (FRANCE).
ANTIBACTERIAL SUBSTANCES PRODUCED BY MARINE BACTERIA (IN FRENCH),
W71-06203 05C

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, GIF-SUR-YVETTE (FRANCE). CENTRE DE RECHERCHES HYDROBIOLOGIQUES.
INVESTIGATIONS OF THE TECHNIQUES OF PURIFICATION OF ALGAL CULTURES ELABORATION OF METHODS APPLICABLE TO DESMIDS, FILAMENTOUS CYANOPHYTES, AND DIATOMS, (IN FRENCH),
W71-06002 07B

CENTRO DI STUDIO SULLA CORROSIONE MARINA DEI METALLI, GENOA (ITALY).
POSSIBILITY OF STUDYING THE EFFECTS OF POLLUTION ON BENTHIC ORGANISMS EMPLOYING IMMERSED PANELS (IN FRENCH),
W71-06205 05C

CHEVRON OIL FIELD RESEARCH CO., LA HABRA, CALIF.
EXTRAPOLATION OF HISTORICAL STORM DATA FOR ESTIMATING DESIGN WAVE HEIGHTS,
W71-06123 07C

CLARK UNIV., WORCESTER, MASS.
COMPREHENSIVE ENVIRONMENTAL PLANNING,
W71-05950 06B

CLOISTERDALE FARMS, EPHRATA, PA.
AGRICULTURE WASTE RESEARCH NEEDS,
W71-06452 05D

COAST GUARD, WASHINGTON, D.C.
ABSTRACT OF PROCEEDINGS, HAZARDOUS POLLUTING SUBSTANCES SYMPOSIUM ANNEX 1 TO STUDY ON CONTROL OF HAZARDOUS POLLUTING SUBSTANCES, SEPT. 14-16, 1970. NEW ORLEANS, LA.
W71-06270 05B

COAST GUARD, WASHINGTON, D.C. APPLIED TECHNOLOGY DIV.
A STUDY OF THE BEHAVIOR OF OIL SPILLS IN THE ARCTIC,
W71-06101 05B

COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N.H.
SETTLING CHARACTERISTICS OF ACTIVATED SLUDGE AT LOW TEMPERATURE,
W71-06107 05D

A RATIONAL APPROACH TO THE DESIGN OF AERATED SEWAGE LAGOONS,
W71-06267 05D

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF ATMOSPHERIC SCIENCE.
OPPORTUNITIES FOR MODIFYING WEATHER TO AUGMENT PRECIPITATION AND SUPPRESS HAIL,
W71-06132 03B

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF POLITICAL SCIENCE.
PUBLIC PARTICIPATION IN WATER PLANNING A CRITIQUE OF THEORY, DOCTRINE, AND PRACTICE,
W71-06315 06B

COLORADO UNIV., BOULDER. DEPT. OF BIOLOGY.
COLORADO SEMIDRAINAGE MOUNTAIN LAKES,
W71-06165 02H

COLUMBIA UNIV., NEW YORK.
URBAN PLANNING ASPECTS OF WATER POLLUTION CONTROL,
W71-05944 06B

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CRONULLA (AUSTRALIA). DIV. OF FISHERIES AND OCEANOGRAPHY.
EH AS AN OPERATIONAL PARAMETER IN ESTUARINE STUDIES,
W71-05873 02L

CONNECTICUT UNIV., STORRS. INST. OF WATER RESOURCES.
CONNECTICUT WATER LAW JUDICIAL ALLOCATION OF WATER RESOURCES,
W71-06273 06E

CONNECTICUT UNIV., STORRS. DEPT. OF AGRICULTURAL ENGINEERING.
ON UNIFORM FLOW THROUGH SMOOTH RECTANGULAR OPEN CHANNELS, W71-05863 08B

CONSOER, TOWNSEND AND ASSOCIATES, FLINT, MICH.
MASTER PLAN FOR THE DEVELOPMENT OF WATER DISTRIBUTION FACILITIES FOR GENESEE COUNTY, ENGINEERING REPORT. W71-05933 08A

CORNELL AERONAUTICAL LAB., INC., BUFFALO, N.Y.
THE EFFECTS OF THERMAL DISCHARGES ON THE STRATIFICATION CYCLE OF LAKES, W71-06082 05C

CORNELL UNIV., ITHACA, N.Y.
ALTERNATIVES FOR THE TREATMENT AND DISPOSAL OF ANIMAL WASTES, W71-06044 05D

CORPS OF ENGINEERS, LOS ANGELES, CALIF.
FLOOD PLAIN INFORMATION, CALLEGUAS CREEK, VICINITY OF MOORPARK, VENTURA COUNTY, CALIFORNIA. W71-05868 04A

CORPS OF ENGINEERS, MOBILE, ALA.
FLOOD PLAIN INFORMATION, ELBA, ALABAMA, PEA RIVER, WHITE WATER AND BEAVER DAM CREEKS. W71-05867 04A

CORPS OF ENGINEERS, TULSA, OKLA.
FLOOD PLAIN INFORMATION, KINGFISHER AND UNCLE JOHN'S CREEKS, KINGFISHER, OKLAHOMA. W71-06119 04A

COYNE ET BELLIER, PARIS (FRANCE).
STABILITY OF ROCK SLOPES--GRAPHICAL METHODS, W71-05909 02E

DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA). DEPT. OF BIOLOGY.
THE EFFECT OF VARYING AND CONSTANT TEMPERATURES ON THE SIZE OF A MARINE COPEPOD, W71-06083 05C

DECHARD MUNICIPAL PLANNING COMMISSION, TENN.
COMMUNITY FACILITIES PLAN WATER AND SEWER PLAN PUBLIC IMPROVEMENTS PROGRAM AND CAPITAL BUDGET, DECHERD, TENNESSEE. W71-06105 06B

DEPARTMENT OF AGRICULTURE, WASHINGTON, D.C.
SOIL AND WATER LOANS LAND CONSERVATION AND DEVELOPMENT LOANS. W71-06283 06E

GRANTS FOR PREPARATION OF COMPREHENSIVE AREA PLANS FOR WATER AND SEWER SYSTEMS. W71-06284 06A

DEPARTMENT OF ENERGY, MINES AND RESOURCES, BURLINGTON (ONTARIO). CANADA CENTER FOR INLAND WATERS.
TRACE ELEMENTS IN LAKE ERIE, W71-05880 05A

DISSOLVED MINERAL QUALITY OF GREAT LAKES WATERS, W71-05883 05A

DEPARTMENT OF ENERGY, MINES AND RESOURCES, BURLINGTON (ONTARIO). CANADA CENTER FOR INLAND WATERS.
BOTTOM SEDIMENT SAMPLING, W71-05886 07B

THE QUALITATIVE DISTRIBUTION OF FELDSPARS IN SURFICIAL BOTTOM SEDIMENTS FROM LAKE ONTARIO, W71-05889 02J

DEPARTMENT OF ENERGY, MINES AND RESOURCES, BURLINGTON (ONTARIO). GREAT LAKES DIV.
HYDRAULIC AND WIND-INDUCED CIRCULATION IN A MODEL OF A GREAT LAKE, W71-05897 02H

DEPARTMENT OF ENERGY, MINES AND RESOURCES, OTTAWA (ONTARIO). MARINE SCIENCES BRANCH.
VERTICAL DIFFUSIVITY COEFFICIENT IN A THERMOCLINE, W71-06088 02H

DEPARTMENT OF FISHERIES AND FORESTRY, OTTAWA (ONTARIO).
HEAVY METAL POLLUTION. POLICY AND PROGRAM IMPLICATIONS FOR THE PROTECTION OF THE ECOSYSTEM, W71-06078 05A

DEPARTMENT OF NATIONAL HEALTH AND WELFARE, OTTAWA (ONTARIO).
ACTIVITIES OF THE FOOD AND AGRICULTURE ORGANIZATION AND THE WORLD HEALTH ORGANIZATION REGARDING MERCURY, W71-06079 05A

DEPARTMENT OF PRIMARY INDUSTRIES, BRISBANE (AUSTRALIA).
'KEROSENE' TAINT IN SEA MULLET (MUGIL CEPHALUS LINNAEUS), W71-06185 05C

DEPARTMENT OF THE INTERIOR, WASHINGTON, D.C.
WATER QUALITY STANDARDS. W71-06054 05G

DEPARTMENT OF TRANSPORT, TORONTO (ONTARIO). METEOROLOGICAL BRANCH.
ESTIMATES OF MONTHLY EVAPORATION LOSSES FROM THE GREAT LAKES 1950 TO 1968 BASED ON THE MASS TRANSFER TECHNIQUE, W71-05892 02D

DEUTSCHES HYDROGRAPHISCHES INSTITUT, HAMBURG (WEST GERMANY).
REMARKS ON THE DRIFT OF OILY WASTE IN THE BAY OF HELGOLAND (IN GERMAN), W71-06206 05B

DUKE UNIV., BEAUFORT, N.C. MARINE LAB.
THE INFLUENCE OF ACCLIMATION TEMPERATURE ON THE LIPID COMPOSITION OF FISH GILL MITOCHONDRIA, W71-06321 05C

DURHAM UNIV. (ENGLAND). DEPT. OF BOTANY.
TOXICITY OF ZINC, COPPER AND LEAD TO CHLOROPHYTA FROM FLOWING WATERS, W71-05991 05C

ECONOMIC COMMISSION FOR ASIA AND THE FAR EAST (UN), NEW YORK.
DEVELOPMENT OF WATER RESOURCES IN ASIA AND THE FAR EAST-REPORT OF THE NINTH SESSION OF THE BIENNIAL REGIONAL CONFERENCE ON WATER RESOURCES DEVELOPMENT. W71-05864 06B

WATER RESOURCES DEVELOPMENT IN LAOS. W71-05865 06B

EIDGENOESSISCHE ANSTALT FUER WASSERVERSORGUNG, ABWASSERREINIGUNG UND GEWAESSERSCHUTZ, ZURICH (SWITZERLAND).
SOLID WASTE DEPOSITION AND WATER PROTECTION (IN GERMAN), W71-06210 05E

ELECTROCONSULT, MILAN (ITALY).
VENICE IS SINKING INTO THE SEA, W71-06120 02F

ENVIROGENICS CO., EL MONTE, CALIF. DIVISION OF AEROJET-GENERAL CORPORATION.
A FEASIBILITY ANALYSIS OF INCINERATOR SYSTEMS FOR RESTORATION OF OIL CONTAMINATED BEACHES, W71-06252 05E

ENVIRONMENT CONTROL ADMINISTRATION, CINCINNATI, OHIO. WATER SUPPLY AND SEA RESOURCES PROGRAM.
SANITARY CONTROL OF SHELLFISH IN KOREA, W71-06110 02L

ENVIRONMENTAL DATA SERVICE, SILVER SPRING, MD.
DEVELOPMENT OF SNOW LOAD DESIGN DATA FOR THE UNITED STATES, W71-06141 02C

ENVIRONMENTAL PROTECTION AGENCY, CINCINNATI, OHIO. WATER QUALITY OFFICE.
CHEMICAL CHARACTERIZATION OF BOTTOM SEDIMENTS, W71-05981 05A

ERLANGEN-NUREMBERG UNIV. (WEST GERMANY). ZOOLOGISCHES INSTITUT.
INFLUENCE OF INDUSTRIAL EFFLUENTS ON ARTHROPODS OF THE MARINE SUPRALITTORAL ZONE, (IN GERMAN), W71-06003 05C

ESSO PRODUCTION RESEARCH CO., HOUSTON, TEX.
FACIES AND DEVELOPMENT OF THE COLORADO RIVER DELTA IN TEXAS, W71-05860 02J

FEDERAL POWER COMMISSION, WASHINGTON, D.C.
FACTORS IN WASTE HEAT DISPOSAL ASSOCIATED WITH POWER GENERATION, W71-05932 08A

FEDERAL POWER COMMISSION, WASHINGTON, D.C. BUREAU OF POWER.
PROBLEMS IN DISPOSAL OF WAST HEAT FROM STEAM-ELECTRIC PLANTS. W71-05931 08A

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, ARLINGTON, VA.
OPTIMUM INVESTMENT IN WATER POLLUTION CONTROL, W71-05938 06B

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, ATHENS, GA. SOUTHEAST WATER LAB.
THE PESTICIDE BURDEN IN WATER AND ITS SIGNIFICANCE, W71-06439 05B

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, CINCINNATI, OHIO. DIV. OF TECHNICAL SERVICES.
CASE HISTORIES IMPROVED ACTIVATED SLUDGE PLANT PERFORMANCE BY OPERATIONS CONTROL, W71-06201 05D

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, KANSAS CITY, MO. MISSOURI BASIN REGION.
ALLIANCE FOR ACTION, W71-06448 05G

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, WASHINGTON, D.C. AGRICULTURAL AND MARINE POLLUTION CONTROL.
ACCOMPLISHMENTS AND GOALS, W71-06449 05G

FEDERAL WATER QUALITY ADMINISTRATION, CINCINNATI, OHIO. ANALYTICAL QUALITY CONTROL LAB.
CHARACTERIZATION OF OIL SLICKS ON SURFACE WATERS, W71-06261 05A

FEDERAL WATER QUALITY ADMINISTRATION, DULUTH, MINN. NATIONAL WATER QUALITY LAB.
EFFECTS ON PH ON THE LIFE CYCLE OF THE MIDGE TANYTARSUS DISSIMILIS, W71-05982 05C

FEDERAL WATER QUALITY ADMINISTRATION, KANSAS CITY, MO. MISSOURI BASIN REGION.
ANIMAL WASTE RUNOFF--A MAJOR WATER QUALITY CHALLENGE,
W71-06114 05B

FISHERIES RESEARCH BOARD OF CANADA, NANAIMO (BRITISH COLUMBIA). BIOLOGICAL STATION.
EUTROPHICATION STUDIES OF A SHALLOW INLET ON VANCOUVER ISLAND,
W71-05988 02L

FLORIDA UNIV., GAINESVILLE AND MISSOURI UNIV., COLUMBIA.
PESTICIDE RESIDUES AND ENVIRONMENTAL ECONOMICS,
W71-05951 05G

FLORIDA UNIV., GAINESVILLE. DEPT. OF ENVIRONMENTAL ENGINEERING.
EUTROPHICATION CAUSE--EFFECT RELATIONSHIPS,
W71-06009 05C

FOOD AND DRUG DIRECTORATE, OTTAWA (ONTARIO). DIV. OF TOXICOLOGY.
EMBRYOTOXICITY OF MERCURY COMPOUNDS,
W71-06081 05C

FRANKLIN INSTITUTE RESEARCH LABS., PHILADELPHIA, PA.
SELECTED URBAN STORM WATER RUNOFF ABSTRACTS (SECOND QUARTERLY ISSUE).
W71-06255 04C

FRANKLIN INST. RESEARCH LABS., PHILADELPHIA, PA.
SELECTED URBAN STORM WATER RUNOFF ABSTRACTS.
W71-06253 04C

SELECTED URBAN STORM WATER RUNOFF ABSTRACTS (FIRST QUARTERLY ISSUE).
W71-06254 04C

FRESHWATER BICLOGICAL ASSOCIATION, WAREHAM, (ENGLAND). RIVER LAB.
A PRELIMINARY STUDY OF THE FEEDING RELATIONSHIPS OF FISH IN A HARD-WATER AND A SOFT-WATER STREAM IN SOUTHERN ENGLAND,
W71-06327 05C

GENESEE COUNTY METROPOLITAN PLANNING COMMISSION, FLINT, MICH. AND BATTELLE MEMORIAL INST., COLUMBUS, OHIO.
GENESEE COUNTY ENVIRONMENTAL HEALTH, CONCLUSIONS REPORT, GENESEE COUNTY, MICHIGAN.
W71-05934 05B

GEOLOGICAL SURVEY OF ALABAMA UNIVERSITY.
HYDROLOGY OF LIMESTONE TERRANES, PHOTOGEOLOGIC INVESTIGATIONS,
W71-05838 02F

GEOLOGICAL SURVEY, CARSON CITY, NEV.
WATER-RESOURCES APPRAISAL OF THE COLUMBUS SALT MARSH-SODA SPRING VALLEY AREA, MINERAL AND ESMERALDA COUNTIES, NEVADA,
W71-05862 04B

GEOLOGICAL SURVEY, DENVER, COLO.
RADIOCHEMICAL ANALYSES OF WATER FROM SELECTED STREAMS, WELLS, SPRINGS, AND PRECIPITATION COLLECTED PRIOR TO REENTRY DRILLING, PROJECT RULISON,
W71-05842 05A

GEOHYDROLOGY OF THE AREA NEAR WOSCO EXPLORATORY HOLE NUMBER 1, UINTAH COUNTY, UTAH,
W71-06153 08H

SOURCES OF NITROGEN IN WATER SUPPLIES,
W71-06435 05B

GEOLOGICAL SURVEY, DENVER, COLO. REGIONAL GEOCHEMISTRY BRANCH.
GEOCHEMICAL SURVEY OF MISSOURI, PLANS AND PROGRESS FOR SECOND SIX-MONTH PERIOD (JANUARY-JUNE, 1970).
W71-05854 02K

GEOCHEMICAL SURVEY OF MISSOURI, PLANS AND PROGRESS FOR FIRST SIX-MONTH PERIOD (JULY-DECEMBER, 1969).
W71-05874 02K

GEOLOGICAL SURVEY, DENVER, COLO. AND NATIONAL PARK SERVICE, YELLOWSTONE NATIONAL PARK, WYO.
DEFORMATION OF LEE-SIDE LAMINAE IN EOLIAN DUNES,
W71-05845 02J

GEOLOGICAL SURVEY, HARRISBURG, PA. WATER RESOURCES DIV.
GROUNDWATER RESOURCES OF THE LOYSVILLE AND MIFFLINTOWN QUADRANGLES IN SOUTH-CENTRAL PENNSYLVANIA,
W71-05853 04B

GEOLOGICAL SURVEY, HONOLULU, HAWAII.
PRELIMINARY REPORT ON THE WATER RESOURCES OF THE WAILUKU AREA,
W71-06155 02E

GEOLOGICAL SURVEY, IOWA CITY, IOWA.
AVAILABILITY OF GROUNDWATER IN DECATUR COUNTY, IOWA,
W71-06175 02F

GEOLOGICAL SURVEY, LINCOLN, NEB.
A PROPOSED STREAMFLOW-DATA PROGRAM FOR NEBRASKA,
W71-06128 07A

GEOLOGICAL SURVEY, LITTLE ROCK, ARK.
WELL RECORDS, DEPTH-TO-WATER MEASUREMENTS, CHEMICAL ANALYSES OF GROUND WATER, DRILLERS LOGS, AND ELECTRIC-LOG INFORMATION IN HEMPSTEAD, LAFAYETTE, LITTLE RIVER, MILLER, AND NEVADA COUNTIES, ARKANSAS,
W71-06229 04B

GEOLOGICAL SURVEY, MENLO PARK, CALIF.
A PORTABLE MULTIPARAMETER WATER QUALITY KIT,
W71-06157 05A

GEOLOGICAL SURVEY, MENLO PARK, CALIF., WATER RESOURCES DIV.
FLOODS FROM SMALL DRAINAGE AREAS IN CALIFORNIA-A COMPILATION OF PEAK DATA OCTOBER 1958 TO SEPTEMBER 1969,
W71-06127 07C

GEOLOGICAL SURVEY, MIAMI, FLA.
SALINE ARTESIAN WATER AS A SUPPLEMENT,
W71-06124 03C

GEOLOGICAL SURVEY, NASHVILLE, TENN., WATER RESOURCES DIV.
SOME FACTORS TO BE CONSIDERED IN THE DESIGN OF WASTE DISPOSAL WELLS,
W71-06199 05D

GEOLOGICAL SURVEY, SACRAMENTO, CALIF.
RECONNAISSANCE INVESTIGATION OF THE SUBSIDENCE OF VENICE AND SUGGESTED STEPS TOWARD ITS CONTROL,
W71-05870 02F

GEOLOGICAL SURVEY, SALT LAKE CITY, UTAH.
WATER RESOURCES OF THE HEBER-KAMAS-PARK CITY AREA, NORTH-CENTRAL UTAH,
W71-05852 02E

GEOLOGICAL SURVEY, TALLAHASSEE, FLA.
WATER QUALITY AT THE DADE-COLLIER TRAINING AND TRANSITION AIRPORT, MIAMI INTERNATIONAL AIRPORT, AND COTTONMOUTH CAMP-EVERGLADES NATIONAL PARK, FLORIDA, NOVEMBER, 1969,
W71-06158 05A

GEOLOGICAL SURVEY, TRENTON, N. J.
A HYDROLOGIC ANALYSIS OF THE NEW JERSEY PINE BARRENS REGION,
W71-06125 02A

GEOLOGICAL SURVEY, TRENTON, N.J.
STATISTICAL SUMMARIES OF NEW JERSEY STREAMFLOW RECORDS,
W71-06228 07C

GEOLOGICAL SURVEY, TUCSON, ARIZ.
WATER CONSERVATION BY REMOVAL OF PHREATOPHYTES,
W71-06154 03B

GEOLOGICAL SURVEY, WASHINGTON, D.C.
SUMMARY OF DATA ON TEMPERATURE OF STREAMS IN NORTH CAROLINA, 1943-67,
W71-05855 07C

WATER RESOURCES OF THE BLACK RIVER BASIN, SOUTHEASTERN MICHIGAN,
W71-05869 07C

GROUNDWATER RECONNAISSANCE OF THE GREEN RIVER BASIN, SOUTHWESTERN WYOMING,
W71-05902 07C

WATER QUALITY OF THE DELAWARE RIVER ESTUARY, JULY THROUGH DECEMBER 1967,
W71-06156 05A

GROUNDWATER RESOURCES OF NELSON COUNTY, NORTHEASTERN NORTH DAKOTA,
W71-06160 07C

GEORGE WASHINGTON UNIV., WASHINGTON, D.C.
ECONOMIC ANALYSIS IN NATURAL RESOURCE PROGRAMS,
W71-05940 06B

GOSUDARSTVENNYI KOMITET PO ISPOLZOVANIYU ATOMNOI ENERGII SSSR, MOSCOW.
THE PRESENT STATE AND PROSPECTS OF DEVELOPMENT IN RADIOACTIVE WASTE MANAGEMENT IN THE USSR,
W71-06006 05E

GREEN ENGINEERING AFFILIATES, SOMERVILLE, MASS.
REACTION RATES OF PHOTOSYNTHESIS,
W71-06039 05C

GUELPH UNIV. (ONTARIO). DEPT. OF NUTRITION.
NITROGEN AND AMINO ACIDS IN THE FECES OF YOUNG PIGS RECEIVING A PROTEIN-FREE DIET AND DIETS CONTAINING GRADED LEVELS OF SOYBEAN OIL MEAL OR CASEIN,
W71-06451 05B

GULF GENERAL ATOMIC INC., SAN DIEGO, CALIF.
STUDY AND EXPERIMENTS IN WASTE WATER RECLAMATION BY REVERSE OSMOSIS,
W71-06025 05D

GULF SOUTH RESEARCH INST., NEW IBERIA, LA.
METHANOL REQUIREMENT AND TEMPERATURE EFFECTS IN WASTE WATER DENITRIFICATION,
W71-06246 05D

HARVARD UNIV., CAMBRIDGE, MASS.
ORGANIZING WATER POLLUTION CONTROL THE SCOPE AND STRUCTURE OF RIVER BASIN AUTHORITIES,
W71-05936 06F

STREAMFLOW SYNTHESIS,
W71-05946 04A

THE ORGANIZATION OF ECONOMIC ACTIVITY ISSUES PERTINENT TO THE CHOICE OF MARKET VERSUS NONMARKET ALLOCATION,
W71-05966 06C

HAWAII INST. OF GEOPHYSICS, HONOLULU.
DEVELOPMENT OF AN INSTRUMENT FOR MEASURING THE CONCENTRATION OF DISSOLVED OXYGEN IN SEA WATER IN SITU,
W71-06104 05A

HAWAII UNIV., HONOLULU. WATER RESOURCES RESEARCH CENTER.
ARTIFICIAL RECHARGE PRACTICES IN HAWAII,
W71-06263 04B

HEBREW UNIV., JERUSALEM (ISRAEL). DEPT. OF BOTANY.
RADIAL WATER AND SOLUTE FLOWS IN ROOTS OF ZEA MAYS I. WATER FLOW,
W71-06064 02I

HOBART COLL., GENEVA, N.Y. AND MICHIGAN UNIV., ANN ARBOR. DEPT. OF METEOROLOGY AND OCEANOGRAPHY.
GEOLOGICAL, CHEMICAL, AND PHYSICAL ATTRIBUTES OF SEDIMENTS IN SENECA LAKE, NEW YORK,
W71-05890 02J

HOLZMACHER, MCLENDON AND MURRELL, MELVILLE, N.Y.
WATER RESOURCES OF NASSAU AND SUFFOLK COUNTIES,
W71-05843 03D

HYDRAULICS RESEARCH STATION, WALLINGFORD (ENGLAND).
FLAT-VEE WEIRS IN ALLUVIAL CHANNELS,
W71-05849 08B

HYDROBIOLCGISCH INSTITUTT, NIEUWERSLUIS, (NETHERLANDS) AND WESTFIELD COLL., LONDON (ENGLAND).
METHODS FOR CHEMICAL ANALYSIS OF FRESH WATERS.
W71-06159 02K

IDAHO UNIV., MOSCOW. DEPT. OF BIOLOGICAL SCIENCES.
SOME EFFECTS OF ANTIMYCIN IN AN OLIGOTROPHIC LAKE,
W71-06323 05C

IIT RESEARCH INST., CHICAGO, ILL.
IMPROVEMENT OF THE CORROSION RESISTANCE OF ALUMINUM BRASS FOR USE IN SEA WATER CONVERSION PLANTS,
W71-06234 08G

DEVELOPMENT OF PHOSPHATE-FREE HOME LAUNDRY DETERGENTS,
W71-06247 05G

ILLINOIS INST. OF TECH., CHICAGO.
PROCESS OPTIMA IN ACTIVATED SLUDGE,
W71-06032 05D

ILLINOIS INST. OF TECH., CHICAGO. DEPT. OF CIVIL ENGINEERING.
FOAM SEPARATION PROCESSES FROM INDUSTRIAL WASTE TREATMENT PHENOL, PHOSPHATE, AND HEXAVALENT CHROMIUM,
W71-06194 05D

ILLINOIS STATE WATER SURVEY, URBANA.
NITRATE POLLUTION OF WATER,
W71-06130 05B

ECONOMIC DESIGN OF CENTRAL WATER SUPPLY SYSTEMS FOR MEDIUM SIZED TOWNS,
W71-06312 06B

ILLINOIS UNIV., CHICAGO AND MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
SETTLEMENT PROBLEM ORIENTED COMPUTER LANGUAGE,
W71-05915 08D

ILLINOIS UNIV., URBANA.
OXIDATION DITCH TREATMENT OF SWINE WASTES, SUMMARY REPORT,
W71-06442 05D

ILLINOIS UNIV., URBANA. DEPT. OF AGRONOMY AND MISSOURI UNIV., COLUMBIA. DEPT. OF AGRONOMY.
CHEMISTRY OF NITROGEN IN SOILS,
W71-06436 05B

ILLINOIS UNIV., URBANA. DEPT. OF CIVIL ENGINEERING.
WATER RESOURCES SYSTEMS ANALYSIS OF DISCRETE DIFFERENTIAL DYNAMIC PROGRAMMING,
W71-05922 06A

A PROGRAMMING MODEL FOR FARM IRRIGATION SYSTEMS,
W71-05923 03F

ILLINOIS UNIV., URBANA. DEPT. OF GEOLOGY.
A STUDY OF FRESHWATER SAND GRAIN SURFACES BY SCANNING ELECTRON MICROSCOPY,
W71-05887 07B

ILLINOIS UNIV., URBANA. DEPT. OF ZOOLOGY.
PERIPHYTON ACCRUAL IN THE KASKASKIA RIVER AND ADJACENT FLOODPLAIN POOLS IN EAST-CENTRAL ILLINOIS,
W71-06011 02I

INDIAN AGRICULTURAL RESEARCH INST., NEW DELHI.
PHYSIOLOGY OF BOLL SHEDDING IN COTTON IV. CORRELATION STUDIES ON FLOWER PRODUCTION AND BOLL SHEDDING IN RELATION TO TEMPERATURE AND RAINFALL,
W71-06056 03F

INTERNATIONAL POWER AND ENGINEERING CONSULTANTS, LTD., VANCOUVER (BRITISH COLUMBIA).
RESONANCE IN PRESSURIZED PIPING SYSTEMS,
W71-05905 08B

IONICS, INC., WATERTOWN, MASS.
RESEARCH ON PIEZODIALYSIS - SECOND REPORT,
W71-06236 03A

IOWA STATE UNIV. AMES. DEPT. OF AGRONOMY.
LAND AND WATER MANAGEMENT FOR MINIMIZING SEDIMENT,
W71-06432 05G

IOWA STATE UNIV., AMES. DEPT. OF AGRICULTURAL ENGINEERING AND AGRICULTURAL RESEARCH SERVICE, BELTSVILLE, MD. WATER CONSERVATION RESEARCH DIV.
POLLUTION BY SEDIMENT SOURCES AND THE DETACHMENT AND TRANSPORT PROCESSES,
W71-06430 05B

IOWA STATE UNIV., AMES. DEPT. OF AGRICULTURAL ENGINEERING.
YIELD REDUCTION BY CONTROLLED FLOODING OF CORN,
W71-06152 03F

IOWA STATE UNIV., AMES. DEPT. OF AGRONOMY.
ESTABLISHMENT OF PERENNIAL FORAGES I. SUBSEQUENT YIELDS II. SUBSEQUENT ROOT DEVELOPMENT,
W71-06215 03F

BEHAVIOR OF SOIL AND FERTILIZER PHOSPHORUS IN RELATION TO WATER POLLUTION,
W71-06434 05B

IOWA STATE UNIV., AMES. DEPT. OF CIVIL ENGINEERING.
EFFECTS OF SURFACE RUNOFF ON THE FEASIBILITY OF MUNICIPAL ADVANCED WASTE TREATMENT,
W71-06445 05D

IOWA STATE UNIV., AMES. DEPT. OF ECONOMICS.
ECONOMIC ASPECTS,
W71-06447 05G

IOWA STATE UNIV., AMES. DEPT. OF ZOOLOGY AND ENTOMOLOGY.
CHEMISTRY AND METABOLISM OF INSECTICIDES,
W71-06438 05C

PESTICIDES AND PEST MANAGEMENT FOR MAXIMUM PRODUCTION AND MINIMUM POLLUTION,
W71-06441 05G

IOWA UNIV., IOWA CITY. COLL. OF LAW.
LEGAL ASPECTS,
W71-06446 05G

JAMAICA BAY ENVIRONMENTAL STUDY GROUP, N.Y.
JAMAICA BAY AND KENNEDY AIRPORT A MULTIDISCIPLINARY ENVIRONMENTAL STUDY.
W71-06045 06G

JOHN WEBSTER BROWN, INC., RENO, NEV.
AN APPROACH TO SNOW LOAD EVALUATION,
W71-06142 02C

JOHNS HOPKINS UNIV., BALTIMORE, MD. CHESAPEAKE BAY INST.
DIFFUSION FROM A CONTINUOUS SOURCE IN A UNIFORM SHEAR FLOW,
W71-05872 05B

JOHNSON AND ANDERSON, INC., PONTIAC, MICH.
DISCUSSION OF THE USES OF ELECTRONIC PLOTTING IN GROUNDWATER ENGINEERING,
W71-05906 07C

KANSAS STATE UNIV., MANHATTAN. DEPT. OF AGRONOMY, AND KANSAS STATE UNIV., MANHATTAN. DEPT. OF AGRICULTURAL ENGINEERING.
EFFECT OF FEEDLOT LAGOON WATER ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF SOILS,
W71-05974 05C

KANSAS UNIV., LAWRENCE. DEPT. OF GEOGRAPHY.
THE WOODSMAN'S ASSAULTS ON THE DOMAIN OF THE CATTLEMAN,
W71-06072 03F

KANSAS WATER RESOURCES RESEARCH INST., MANHATTAN.
WATER QUALITY MODELING AND PREDICTION,
W71-06186 05G

KARLSRUHE UNIV. (WEST GERMANY).
THE NUMERICAL DETERMINATION OF STRESSES AND DEFORMATIONS IN ROCK TAKING INTO ACCOUNT DISCONTINUITIES,
W71-05917 08E

KENTUCKY UNIV., LEXINGTON.
UNCERTAINTY AND ITS EFFECT ON CAPITAL INVESTMENT ANALYSIS,
W71-05954 06B

KIEL UNIV. (WEST GERMANY). INSTITUT FUER MEERESKUNDE.
EFFECT OF TEMPERATURE ON THE PH OF SEAWATER,
W71-06167 02K

KUMAMOTO UNIV. (JAPAN). MEDICAL SCHOOL.
BIOLOGICAL REACTIONS AND PATHOLOGICAL CHANGES OF HUMAN BEINGS AND ANIMALS UNDER THE CONDITION OF ORGANIC MERCURY CONTAMINATION,
W71-06076 05C

LOCKHEED-CALIFORNIA CO., BURBANK.
UNDERSTANDING SYSTEMS ENGINEERING,
W71-05918 06A

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT, CALIF.
REPORT ON TRAPEZOIDAL FLUME MODEL.
W71-05929 08B

LOUISIANA STATE UNIV., BATON ROUGE. COASTAL STUDIES INST.
SEDIMENTATION IN A MALAYSIAN HIGH TIDE TROPICAL DELTA,
W71-05858 02J

LOUISIANA STATE UNIV., BATON ROUGE. DEPT. OF AGRONOMY.
UREA CONVERSION TO AMMONIA IN WATERLOGGED SOILS,
W71-05866 02K

MACKAY (A.M.) AND ASSOCIATES, OWEN SOUND (ONTARIO).
PORT ELGIN'S OXIDATION DITCH,
W71-06027 05D

MAINE UNIV., ORONO. DEPT. OF CHEMICAL ENGINEERING.
INDUCED AIR MIXING OF LARGE BODIES OF POLLUTED WATER,
W71-06245 05G

MARYLAND DEPT. OF RESEARCH AND EDUCATION, SOLOMONS. CHESAPEAKE BIOLOGICAL LAB.
THERMAL POLLUTION, AQUACULTURE AND PATHOBIOLOGY IN AQUATIC SYSTEMS,
W71-06092 05C

MARYLAND DEPT. OF RESEARCH AND EDUCATION, SOLOMONS. CHESAPEAKE BIOLOGICAL LAB.
POWER PLANTS EFFECTS OF CHLORINATION ON ESTUARINE PRIMARY PRODUCTION,
W71-06097 05C

MARYLAND DEPT. OF WATER RESOURCES, BALTIMORE. DIV. OF WATER QUALITY INVESTIGATIONS.
THE MONOCACY RIVER-PHYSICAL, CHEMICAL AND BACTERIOLOGICAL WATER QUALITY REPORT NUMBER 1, MARCH-DECEMBER 1966,
W71-06176 05B

MARYLAND GEOLOGICAL SURVEY, BALTIMORE.
AVAILABILITY OF GROUNDWATER IN CHARLES COUNTY, MARYLAND,
W71-06168 02F

MARYLAND UNIV., COLLEGE PARK.
INTRODUCTION, PROCEEDINGS OF 2ND THERMAL WORKSHOP OF UNITED STATES INTERNATIONAL BIOLOGICAL PROGRAM,
W71-06075 05C

MARYLAND UNIV., COLLEGE PARK. DEPT. OF BOTANY.
ENVIRONMENTALLY-INDUCED CHANGES IN THE FATTY ACIDS OF CHLORELLA,
W71-05992 02I

MARYLAND UNIV., COLLEGE PARK. DEPT. OF MECHANICAL ENGINEERING.
THE MIXING OF A SHALLOW SUBMERGED HEATED WATER JET WITH AN AMBIENT RESERVOIR,
W71-06084 05C

MARYLAND UNIV., COLLEGE PARK. DEPT. OF SOILS.
POLLUTION - ARE FERTILIZERS AT FAULT,
W71-05996 05B

MARYLAND UNIV., COLLEGE PARK. INST. FOR FLUID DYNAMICS AND APPLIED MATHEMATICS AND MARYLAND UNIV., COLLEGE PARK. GRADUATE METECROLOGY PROGRAM.
THE GENERATION OF LANGMUIR CIRCULATIONS BY THE EDDY PRESSURE OF SURFACE WAVES,
W71-05871 02H

MASSACHUSETTS UNIV., AMHERST. DEPT. OF AGRICULTURAL ENGINEERING.
LIQUID HANDLING OF POULTRY MANURE,
W71-06450 05D

MASSACHUSETTS UNIV., AMHERST. DEPT. OF AGRICULTURAL AND FOOD ECONOMICS.
MEASURING INTANGIBLE BENEFITS--SOME NEEDED RESEARCH,
W71-06313 06B

METEOROLOGICAL SERVICE OF CANADA, TORONTO (ONTARIO).
SOME UNUSUAL SURFACE WATER TEMPERATURE PATTERNS IN THE GREAT LAKES, AS DETECTED BY AIRBORNE RADIATION THERMOMETER SURVEYS,
W71-05898 07B

METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, ILL.
PLANKTON REDUCTION IN THE REVERSED FLOW WATERWAYS OF THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO,
W71-05924 05B

METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, ILL. DEPT. OF RESEARCH AND CONTROL.
NORTH SIDE TREATMENT PLANT CHLORINATION,
W71-05925 05D

METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, ILL.
PHOSPHATE REMOVAL FORM TERTIARY EFFLUENT WITH ION EXCHANGE MATERIALS,
W71-05926 05D

METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, ILL. RESEARCH AND DEVELOPMENT LAB.
FE CL3 ADDITION EXPERIMENTS FOR IMPROVED EFFLUENT QUALITY AT THE CALUMET TREATMENT PLANT, INTERIM REPORT,
W71-05927 05D

MIAMI CONSERVANCY DISTRICT, DAYTON, OHIO.
POTENTIAL FOR STREAMFLOW AUGMENTATION BY GROUNDWATER PUMPING,
W71-06118 04B

MICHIGAN STATE UNIV., EAST LANSING.
THE ABSENCE OF KNOWLEDGE OF DISTRIBUTIONAL IMPACTS AN OBSTACLE TO EFFECTIVE POLICY ANALYSIS AND DECISIONS,
W71-05963 06B

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF BOTANY AND NORTH CAROLINA UNIV., CHAPEL HILL. DEPT. OF ZOOLOGY.
DIURNAL CHANGES IN STRATIFICATION AND DISSOLVED OXYGEN IN THE SURFACE WATERS OF LAKE MICHIGAN,
W71-05900 02H

MICHIGAN TECHNOLOGICAL UNIV., HOUGHTON. DEPT. OF BIO SCIENCES.
THE USE OF CONCENTRATIONS OF ELECTROLYTES AND NATURALLY FLUORESCENT MATERIALS TO STUDY WATER MASS MOVEMENTS IN A FRESHWATER 'ESTUARY',
W71-05877 02L

MICHIGAN UNIV., ANN ARBOR. DEPT. OF GEOGRAPHY.
ECOLOGY AND SPATIAL ANALYSIS,
W71-06317 06F

MICHIGAN UNIV., ANN ARBOR. DEPT. OF METEOROLOGY AND OCEANOGRAPHY AND MICHIGAN UNIV., ANN ARBOR. GREAT LAKES RESEARCH DIV.
SURFACE WATER INPUTS OF IODINE, BROMINE, AND CHLORINE TO LAKE HURON,
W71-05882 05B

MICHIGAN UNIV., ANN ARBOR. DEPT. OF METEOROLOGY AND OCEANOGRAPHY.
WAVE FORCES IN LAKE ERIE,
W71-05894 02H

MICHIGAN UNIV., ANN ARBOR. GREAT LAKES RESEARCH DIV.
PLANKTON DIATOM ASSEMBLAGES IN LAKE MICHIGAN,
W71-05984 05C

MICHIGAN WATER RESOURCES COMMISSION, LANSING.
WATER POLLUTION PROBLEMS AND CONTROL PROGRAMS IN MICHIGAN'S PORTION OF THE GREAT LAKES.
W71-06053 05G

MINISTRY OF WORKS, WELLINGTON (NEW ZEALAND). WATER AND SOIL DIV.
THE MATTHES ROLLING DIAMETER AS AN INDICATOR OF CHANNEL STABILITY,
W71-06169 02J

MINNESOTA UNIV., MINNEAPOLIS.
TEMPERATURE CONTROL IN OUTDOOR EXPERIMENTAL PONDS,
W71-06093 05C

MINNESOTA UNIV., MINNEAPOLIS. LIMNOLOGICAL RESEARCH CENTER.
LIMNOLOGY OF ZUNI SALT LAKE, NEW MEXICO,
W71-05846 02H

MINNESOTA UNIV., ST. PAUL.
MARGINAL COSTS OF ALTERNATIVE LEVELS OF WATER QUALITY IN THE UPPER MISSISSIPPI RIVER,
W71-06191 05G

MINNESOTA UNIV., ST. PAUL. DEPT. OF SOIL SCIENCE.
FERTILIZER MANAGEMENT FOR POLLUTION CONTROL,
W71-06437 05G

MISSOURI UNIV., COLUMBIA. DEPT. OF AGRICULTURAL ECONOMICS.
PUBLIC WATER FOR RURAL AREAS AND SMALL TOWNS,
W71-05973 06D

MISSOURI UNIV., COLUMBIA. DEPT. OF ZOOLOGY AND MISSOURI DEPT. OF CONSERVATION, COLUMBIA.
EFFECTS OF AGRICULTURAL POLLUTANTS ON RECREATIONAL USES OF SURFACE WATERS,
W71-06444 05C

MISSOURI UNIV., ROLLA. DEPT. OF CIVIL ENGINEERING.
PENETRATION IN A GRADED FILTER,
W71-06151 08B

MISSOURI UNIV., ROLLA. DEPT. OF ENVIRONMENTAL HEALTH AND MISSOURI UNIV., ROLLA. DEPT. OF GEOCHEMISTRY.
POLLUTION FROM MINES IN THE 'NEW LEAD BELT' OF SOUTH EASTERN MISSOURI,
W71-05837 05A

MISSOURI WATER RESOURCES RESEARCH CENTER.
DEVELOPMENT OF NEUTRON ACTIVATION FOR INVESTIGATION OF WATER CLARIFICATION,
W71-06265 05D

MIXING EQUIPMENT CO., ROCHESTER, N.Y.
FUNDAMENTAL ASPECTS OF SURFACE AERATOR PERFORMANCE AND DESIGN,
W71-06030 05D

MOBIL RESEARCH AND DEVELOPMENT CORP., DALLAS, TEX.
FORMATION EVALUATION BY INSPECTION WITH THE BOREHOLE TELEVIEWER,
W71-05916 07B

MONTANA STATE UNIV., BOZEMAN.
GRAPHIC DISSOLVED OXYGEN COMPUTATION,
W71-06121 01A

MONTANA STATE UNIV., BOZEMAN. WATER RESOURCES RESEARCH CENTER.
WATER, WATER EVERYWHERE---BUT A STUDY OF THE POLITICO-ADMINISTRATIVE ASPECTS OF WATER DEVELOPMENT IN MONTANA,
W71-06226 06E

NASHVILLE METROPOLITAN GOVERNMENT AND DAVIDSON COUNTY, TENN. SEWERAGE SERVICES.
CONTROL OF INFILTRATION IN SEWER SYSTEMS-DESIGN AND MAINTENANCE,
W71-06197 05D

NATIONAL AND UNIV. INST. OF AGRICULTURE, REHOVOTH (ISRAEL). VOLCANI INST. OF AGRICULTURE RESEARCH AND HEBREW UNIV. JERUSALEM (ISRAEL).
EFFECT OF TIME OF EXPOSURE TO SALINITY ON GROWTH, WATER STATUS AND SALT ACCUMULATION IN BEAN PLANTS,

W71-06074 02I

NATIONAL AND UNIV. INST. OF AGRICULTURE, REHOVOTH (ISRAEL). VOLCANI INST. OF AGRICULTURE RESEARCH.
THE INFLUENCE OF VARIOUS SOIL MOISTURE-REGIMES ON THE YIELD AND QUALITY OF COTTON IN AN ARID ZONE,
W71-06217 03F

NATIONAL CANNERS ASSOCIATION RESEARCH FOUNDATION, BERKELEY, CALIF. WESTERN RESEARCH LAB.
WASTE REDUCTION IN FOOD CANNING OPERATIONS,
W71-06257 05D

NATIONAL INST. OF NEUROLOGICAL DISEASE AND STROKE, BETHESDA, MD. LAB. OF NEUROCHEMISTRY.
METABOLISM OF QUINALDINE(2-METHYL-QUINOLINE). UPTAKE AND EXCRETION BY NURSE SHARKS,
W71-06324 05C

NATIONAL RESEARCH COUNCIL OF CANADA (OTTAWA). DIV. OF BUILDING RESEARCH.
SNOW LOADS FOR THE DESIGN OF ROOFS IN CANADA,
W71-06143 08A

NATIONAL RESEARCH COUNCIL OF CANADA, OTTAWA (ONTARIO). DIV. OF BUILDING RESEARCH.
VARIATION OF GROUND SNOW LOADS IN BRITISH COLUMBIA,
W71-06140 02C

NATIONAL SWEDISH ENVIRONMENT PROTECTION BOARD, STOCKHOLM.
MAN-MADE SOURCES OF MERCURY,
W71-06077 05B

NATIONAL WATER QUALITY LAB., DULUTH, MINN.
SOME FACTORS INFLUENCING TOXICITY OF LINEAR ALKYLATE SULFONATE (LAS) TO THE BLUEGILL,
W71-06260 05C

AN ELECTRODE CHAMBER FOR RECORDING RESPIRATORY AND OTHER MOVEMENTS OF FREE-SWIMMING ANIMALS,
W71-06328 05A

NEBRASKA UNIV., LINCOLN. AGRICULTURAL EXPERIMENT STATION.
INFRARED PHOTOS CAN MAP SOILS,
W71-06058 07B

HOW TO SELECT AND APPLY ZINC FERTILIZER,
W71-06059 03F

PLANTING CORN IN NATIVE SOD,
W71-06060 03F

RURAL WATER DISTRICTS--HERE IS WHY THEY ARE NEEDED,
W71-06061 06B

NEBRASKA UNIV., LINCOLN. DEPT. OF AGRICULTURAL ENGINEERING.
ANAEROBIC DECOMPOSITION OF SWINE EXCREMENT,
W71-06453 05D

NEW HAMPSHIRE UNIV., DURHAM. DEPT. OF ZOOLOGY.
ALGAL TOXINS,
W71-05999 02I

NEW MEXICO STATE UNIV., UNIVERSITY PARK AND ARIZONA UNIV., TUCSON.
VARIATIONS IN WATER STRESS IN ONE-YEAR-OLD NEEDLES OF A PONDEROSA PINE,
W71-06057 02I

NEW MEXICO STATE UNIV., UNIVERSITY PARK. DEPT. OF CIVIL ENGINEERING.
TREATMENT OF FISH HATCHERY EFFLUENT FOR RECYCLE,
W71-06024 05D

NEW SCHOOL FOR SOCIAL RESEARCH, NEW YORK.
THE DEMAND FOR LEISURE,
W71-05970 06D

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY.
WATER RESOURCES MANAGEMENT IN THE PUBLIC INTEREST,
W71-06314 06B

NEW YORK STATE DEPT. OF HEALTH, ALBANY.
THERMAL CRITERIA - A MEASURE TO CONTROL THERMAL POLLUTION,
W71-06096 05C

NEW YORK STATE DEPT. OF HEALTH, ALBANY. DIV. OF LABS AND RESEARCH.
EVALUATION OF AN AUTOMATIC CHEMICAL ANALYSIS MONITOR FOR WATER QUALITY PARAMETERS,
W71-06005 05A

NORTH CAROLINA STATE DEPT. OF WATER AND AIR RESOURCES, RALEIGH.
NORTH CAROLINA WATER PLAN PROGRESS REPORT CHAPTER 6, RESEARCH (DRAFT).
W71-06116 06B

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT OF ZOOLOGY.
A STUDY OF RELATIONSHIPS BETWEEN ZOOPLANKTON ABUNDANCE AND SELECTED ENVIRONMENTAL VARIABLES IN THE PAMLICO RIVER ESTUARY OF EASTERN NORTH CAROLINA,
W71-05985 02I

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF ZOOLOGY.
THE NET EXCHANGES OF PHOSPHORUS BY ESTUARINE SEDIMENTS IN FLOWING WATERS,
W71-06010 02J

NORTH CAROLINA UNIV., CHAPEL HILL AND NORTH CAROLINA UNIV., MOREHEAD CITY. INST. OF MARINE SCIENCES.
STUDIES OF MARINE ESTUARINE ECOSYSTEMS DEVELOPING WITH TREATED SEWAGE WASTES,
W71-06012 02L

MOLLUSCAN STUDIES,
W71-06015 02L

NORTH CAROLINA UNIV., CHAPEL HILL AND NORTH CAROLINA UNIV., MOREHEAD CITY. INST. OF MARINE SCIENCES.
FIRST YEAR RECORD OF TOTAL METABOLISM OF MARINE PONDS RECEIVING TREATED WASTES,
W71-06023 02L

NORTH CAROLINA UNIV., CHAPEL HILL.
REGIONAL PLANNING,
W71-05949 06B

NORTH CAROLINA UNIV., CHAPEL HILL. DEPT. OF BOTANY.
FUNGAL SURVEY IN WASTE PONDS AND CREEK,
W71-06013 02L

STUDIES ON ULVA AND OTHER BENTHONIC MARINE ALGAE RECEIVING TREATED SEWAGE IN PONDS AND IN CALICO CREEK AT MOREHEAD CITY, NORTH CAROLINA,
W71-06021 02L

NORTH CAROLINA UNIV., CHAPEL HILL. DEPT. OF ENVIRONMENTAL SCIENCE AND ENGINEERING.
CRUSTACEANS AND FISHES IN THE SEA GRANT PONDS,
W71-06016 02L

NORTH CAROLINA UNIV., CHAPEL HILL. DEPT. OF ENVIRONMENTAL SCIENCES AND ENGINEERING.
CARBON,
W71-06017 02L

NORTH CAROLINA UNIV., CHAPEL HILL. DEPT. OF ENVIRONMENTAL SCIENCES AND ENGINEERING AND NORTH CAROLINA UNIV., MOREHEAD CITY. INST. OF MARINE SCIENCES.
PHOSPHORUS FLUX BETWEEN WATER AND PLANKTON A PRELIMINARY REPORT,
W71-06018 02L

NORTH CAROLINA UNIV., CHAPEL HILL. DEPT. OF ENVIRONMENTAL SCIENCES AND ENGINEERING.
PHYTOPLANKTON POPULATIONS A PRELIMINARY REPORT,
W71-06022 02L

NORTH CAROLINA UNIV., CHAPEL HILL. DEPT. OF ZOOLOGY.
CHARACTERISTICS OF SPARTINA MARSH WHICH IS RECEIVING TREATED MUNICIPAL SEWAGE WASTES,
W71-06014 02L

NORTH CAROLINA UNIV., MOREHEAD CITY. INST. OF MARINE SCIENCES.
THE USE OF CARBON-14 FOR THE STUDY OF THE UPTAKE AND UTILIZATION OF PHYTOPLANKTON BY RANGEA CUNEATA,
W71-06019 02L

BENTHIC PRODUCTIVITY,
W71-06020 02L

NORTH CAROLINA WATER RESOURCES RESEARCH INST., RALEIGH.
LAND USE FUNCTION IN WATER QUALITY MANAGEMENT,
W71-06310 06B

NORTH DAKOTA STATE UNIV., FARGO. DIV. OF NATURAL RESOURCES.
PRIMARY PRODUCTION AND CHEMICAL AND PHYSICAL CHARACTERISTICS OF LAKE ASHTABULA RESERVOIR, NORTH DAKOTA,
W71-06008 02H

NORTH DAKOTA UNIV., GRAND FORKS. DEPT. OF GEOLOGY.
MUSSELS (UNIONIDAE) OF THE RED RIVER VALLEY IN NORTH DAKOTA AND MINNESOTA, USA,
W71-06001 05C

NORTHEASTERN RADIOLOGICAL HEALTH LAB. WINCHESTER, MASS.
LIQUID WASTE EFFLUENTS FROM A NUCLEAR FUEL REPROCESSING PLANT,
W71-06269 05B

NORTHWESTERN UNIV., EVANSTON, ILL.
HORIZONTAL TRANSPORT IN A ROTATING BASIN OF PARABOLIC DEPTH PROFILE,
W71-05903 02E

INFORMATION FOR DECISION MAKING,
W71-05953 06B

SENSITIVITY ANALYSIS IN DECISION MAKING,
W71-05955 06B

NORTHWESTERN UNIV., EVANSTON, ILL. DEPT. OF ENGINEERING SCIENCES AND MICHIGAN UNIV., ANN ARBOR. GREAT LAKES RESEARCH DIV.
STATISTICAL ANALYSIS OF CURRENTS AT TWO NEAR-BY STATIONS IN LAKE MICHIGAN, SUMMER, 1967,
W71-05893 02H

NORTHWESTERN UNIV., EVANSTON, ILL. TECHNOLOGICAL INST.
WIND-DRIVEN CURRENTS IN A LONG ROTATING CHANNEL,
W71-05904 02E

A CASE STUDY OF COASTAL CURRENTS IN LAKE MICHIGAN,
W71-06174 02H

NORTHWESTERN UNIV., EVANSTON, ILL. AND CARNEGIE-MELLON UNIV., PITTSBURGH, PA.
EXTERNALITIES, INFORMATION AND ALTERNATIVE COLLECTIVE ACTION,
W71-05964 06B

OAK RIDGE NATIONAL LAB., TENN.
SURVEY OF DESALTING PROCESSES FOR USE IN WASTE WATER TREATMENT,
W71-06042 05D

W71-06268 05D

OFFICE OF THE CHIEF OF ENGINEERS (ARMY), WASHINGTON, D.C. CIVIL WORKS DIRECTORATE.
THE AUTOMATIC HYDROLOGICAL RADIO REPORTING NETWORK, NEW ENGLAND DIVISION, CORPS OF ENGINEERS,
W71-06149 07A

OHIO DEPT. OF NATURAL RESOURCES, COLUMBUS. DIV. OF WATER.
THE CONSERVANCY DISTRICT LAW (OUTLINE AND TEXT OF OHIO CONSERVANCY DISTRICT LAW).
W71-06046 06E

OHIO STATE UNIV., COLUMBUS. DEPT. OF MICROBIAL AND CELLULAR BIOLOGY.
ALDRIN REMOVAL FROM LAKE WATER BY FLOCCULENT BACTERIA,
W71-06000 05G

OHIO STATE UNIV., COLUMBUS. WATER RESOURCES CENTER.
COMPUTER METHODS FOR TRANSIENT ANALYSIS OF WATER-TABLE AQUIFERS,
W71-05920 02F

MONTHLY VARIATION IN PHOSPHATE AND RELATED CHEMICALS FOUND IN THE SEDIMENT IN THE ISLAND AREA OF LAKE ERIE, 1967-68, WITH REFERENCE TO SAMPLES COLLECTED IN 1964, 1965, AND 1966,
W71-06187 05B

OKLAHOMA STATE UNIV., DEPT. OF AGRICULTURAL ECONOMICS.
AN ECONOMIC ANALYSIS OF THE INTERTEMPORAL ALLOCATION OF GROUNDWATER IN THE CENTRAL OGALLALA FORMATION,
W71-06266 04B

OKLAHOMA STATE UNIV., STILLWATER. BIOENGINEERING LABS.
SOME EFFECTS OF HIGH SALT CONCENTRATIONS ON ACTIVATED SLUDGE,
W71-06034 05D

OKLAHOMA STATE UNIV., STILLWATER. DEPT. OF AGRICULTURAL ECONOMICS.
IMPLICATIONS OF WATER QUALITY LAWS FOR THE FEEDLOT INDUSTRY,
W71-06222 05G

OKLAHOMA STATE UNIV., STILLWATER. DEPT. OF AGRICULTURAL ENGINEERING.
THE MECHANISM OF DIRECT RUNOFF FROM RAINFALL,
W71-06264 02G

ONTARIO WATER RESOURCES COMMISSION, REXDALE.
INVESTIGATIONS OF DAILY VARIATIONS IN CHEMICAL BACTERIOLOGICAL AND BIOLOGICAL PARAMETERS AT TWO LAKE ONTARIO LOCATIONS NEAR TORONTO, PART I--CHEMISTRY,
W71-05879 05A

OREGON STATE UNIV., CORVALLIS. DEPT. OF CIVIL ENGINEERING.
AERIAL PHOTOGRAPHIC TRACING OF PULP MILL EFFLUENT IN MARINE WATERS,
W71-06258 05B

OREGON STATE UNIV., CORVALLIS. DEPT. OF FISHERIES AND WILDLIFE.
THE EFFECTS OF THE HERBICIDES DIQUAT AND DICHLOBENIL (CASORON) ON POND INVERTEBRATES PART I. ACUTE TOXICITY,
W71-06181 05C

DISSOLVED OXYGEN CRITERIA FOR THE PROTECTION OF FISH,
W71-06182 05C

OREGON STATE UNIV., CORVALLIS. DEPT. OF OCEANOGRAPHY.
SODIUM, MAGNESIUM, AND CALCIUM SULFATE ION-PAIRS IN SEAWATER AT 25C,
W71-06166 02K

OREGON STATE UNIV., CORVALLIS. WATER RESOURCES RESEARCH INST.
SOCIO-CULTURAL IMPACTS OF WATER RESOURCE DEVELOPMENT IN THE SANTIAM RIVER BASIN,
W71-05921 06B

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, PARIS (FRANCE).
DETERMINATION OF THE BIODEGRADABILITY OF ANIONIC SYNTHETIC SURFACE ACTIVE AGENTS.
W71-05990 05D

PACIFIC GAS AND ELECTRIC CO., EMERYVILLE, CALIF. ENGINEERING RESEARCH DEPT.
THERMAL DISCHARGE A MODEL - PROTOTYPE COMPARISON,
W71-06095 05B

PENNSYLVANIA STATE UNIV., UNVERSITY PARK. DEPT. OF CIVIL ENGINEERING.
A CRAZY IDEA ON URBAN WATER MANAGEMENT,
W71-06309 06B

POITIERS UNIV. (FRANCE). FACULTE DE MEDICINE ET DE PHARMACIE.
THE LIFE OF MICROBES IN THE SEA AND THE CURRENT POLLUTION OUTLOOK (IN FRENCH),
W71-06202 05C

PORTLAND GENERAL ELECTRIC CO., OREG. DEPT. OF ENGINEERING DESIGN.
FIELD INVESTIGATION OF ENVIRONMENTAL EFFECTS OF COOLING TOWERS FOR LARGE STEAM ELECTRIC PLANTS,
W71-05930 05D

PURDUE UNIV., LAFAYETTE, IND.
TWENTY YEARS OF INDUSTRIAL WASTE TREATMENT,
W71-06037 05D

QUIRK, LAWLER, AND MATUSKY ENGINEERS. NEW YORK.
PRELIMINARY PROCESS DESIGN AND TREATABILITY STUDIES OF FISH PROCESSING WASTES,
W71-06035 05D

READING UNIV. (ENGLAND).
SEDIMENTS OF THE MODERN NIGER DELTA A SUMMARY AND REVIEW,
W71-05856 02J

RESOURCE CONSULTANTS, INC., NASHVILLE, TENN.
HYDRAULIC OVERLOADING-FACT OR FICTION,
W71-06198 05D

RESOURCES FOR THE FUTURE INC., WASHINGTON, D.C.
A MODEL OF PUBLIC DECISIONS ILLUSTRATED BY A WATER POLLUTION POLICY PROBLEM,
W71-05939 06A

RESOURCES FOR THE FUTURE, INC., WASHINGTON, D.C.
STRATEGIES FOR ENVIRONMENTAL MANAGEMENT,
W71-05935 06B

ENVIRONMENTAL QUALITY MANAGEMENT,
W71-05941 06B

THE 'PROBLEM SHED' AS A UNIT FOR ENVIRONMENTAL CONTROL,
W71-05945 06B

SAFE YIELD OF AQUIFERS AN ECONOMIC REFORMULATION,
W71-06126 06B

ROBERT S. KERR WATER RESEARCH CENTER, ADA, OKLA. TREATMENT AND CONTROL RESEARCH PROGRAM.
WATER QUALITY MANAGEMENT PROBLEMS IN ARID REGIONS.
W71-06111 05G

ROBERT S. KERR WATER RESEARCH CENTER, ADA, OKLA. AND OKLAHOMA STATE UNIV., STILLWATER. DEPT. OF AGRONOMY.
DEGRADATION OF WATER QUALITY IN IRRIGATION RETURN FLOWS,
W71-06063 03F

ROBERT S. KERR WATER RESEARCH CENTER. ADA, OKLA.
INDUCED HYPOLIMNION AERATION FOR WATER QUALITY IMPROVEMENT OF POWER RELEASES,
W71-06251 05G

ROCHESTER UNIV., N.Y.
THE ABSORPTION OF MERCURY FROM FOOD, ITS SIGNIFICANCE AND NEW METHODS OF REMOVING MERCURY FROM THE BODY,
W71-06080 05C

RUTGERS-THE STATE UNIV., NEW BRUNSWICK, N.J.
THE EFFECT OF CLAY MINERALS ON SURFACTANT BIODEGRADABILITY,
W71-06196 05D

RUTGERS-THE STATE UNIV., NEW BRUNSWICK, N.J. DEPT. OF ENVIRONMENTAL SCIENCES.
FILAMENTOUS MICROORGANISMS AND THE BULKING OF ACTIVATED SLUDGE,
W71-06028 05D

SASKATCHEWAN UNIV., SASKATOON. DEPT. OF AGRICULTURAL ENGINEERING AND SASKATCHEWAN UNIV., SASKATOON. DEPT. OF CIVIL ENGINEERING.
DENSITIES OF PRAIRIE SNOWPACKS,
W71-06137 02C

SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIF AND INSTITUTO HIDROGRAFICO DE LA ARMADA, VALPARAISO (CHILE).
SEASONAL VARIATIONS OF TEMPERATURE, DRIFT, AND HEAT EXCHANGE IN SURFACE WATERS OFF THE WEST COAST OF SOUTH AMERICA,
W71-06094 02L

SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIF.
THE ECOLOGY AND OCEANOGRAPHY OF SEWER OUTFALLS,
W71-05928 06G

SHELL DEVELOPMENT CO., VENTURA, CALIF.
DEPOSITIONAL SEQUENCES AND SAND DISTRIBUTION IN THE POSTGLACIAL RHONE DELTA COMPLEX,
W71-05857 02J

SIERRA HYDROTECHNOLOGY, PLACERVILLE, CALIF., AND CALIFORNIA COOPERATIVE SNOW SURVEYS, SACRAMENTO. DEPT. OF WATER RESOURCES.
THE DEVELOPMENT AND APPLICATION OF A HYDROLOGIC MODEL AS AN OPERATIONAL TOOL,
W71-06135 02C

SLIPPERY ROCK STATE COLLEGE, PA. DEPT. OF GEOLOGY.
GEOCHEMICAL SYSTEMS IN ONONDAGA LAKE (CENTRAL NEW YORK STATE) COMPARED WITH THE GREAT LAKES,
W71-05888 02H

SOIL CONSERVATION SERVICE, ANCHORAGE, ALASKA. WATER SUPPLY FORECASTING BRANCH AND SOIL CONSERVATION SERVICE, ANCHORAGE, ALASKA. SNOW SURVEY FOR ALASKA.
SNOW SURVEY TELEMETRY NETWORKS AND FUTURE PLANS,
W71-06148 07A

SOIL CONSERVATION SERVICE, DENVER, COLO.
THE SOCIAL AND ECONOMIC NEED FOR FLOODPLAIN REGULATION,
W71-06131 04A

SOIL CONSERVATION SERVICE, PORTLAND, OREG.

THE DESCHUTES RIVER HYDROGRAPH FORECAST,
W71-06144 04A

SOLAR, SAN DIEGO, CALIF.
APPLICATION OF IRON-ALUMINUM BASE ALLOYS TO SALINE WATER CONVERSION,
W71-06235 08G

SOUTH CAROLINA UNIV., COLUMBIA.
HYDROGRAPHY, SEDIMENT DISPERSAL, AND RECENT HISTORICAL DEVELOPMENT OF THE PO RIVER DELTA, ITALY,
W71-05859 02J

SOUTHERN CALIFORNIA EDISON CO., LOS ANGELES.
COOLING WATER RESOURCES AND POWER GENERATION,
W71-06091 05G

SOUTHERN ILLINOIS UNIV., CARBONDALE. DEPT. OF BOTANY.
SIGNIFICANCE OF PHOSPHORUS IN WATER SUPPLIES,
W71-06433 05B

STANFORD UNIV., CALIF.
A NOTE ON BIASES IN CAPITAL BUDGETING INTRODUCED BY INFLATION,
W71-05969 06C

STANLEY CONSULTANTS, INC., MUSCATINE, IOWA.
FLOOD PLAIN INFORMATION, ONTONAGON RIVER, ONTONAGON, MICHIGAN, AND LAKE SUPERIOR SHORELINE, ONTONAGON COUNTY, MICHIGAN.
W71-06232 04A

STATE UNIV. OF NEW YORK, ALBANY.
A FIELD STUDY OF LANGMUIR CIRCULATIONS,
W71-05884 02H

STATE UNIV. OF NEW YORK, ALBANY. DEPT. OF ATMOSPHERIC SCIENCES.
JULY CURRENTS NEAR THE SOUTH SHORE OF LAKE ONTARIO,
W71-05978 02H

STATE UNIV. OF NEW YORK, BUFFALO. DEPT. OF BIOLOGY.
SOME VARIATION IN THE QUALITY OF WATER FROM THE SOURCE AND MOUTH OF THE NIAGARA RIVER,
W71-05881 05A

STATE UNIV. OF NEW YORK, BUFFALO. FACULTY OF ENGINEERING AND APPLIED SCIENCES.
WIND INDUCED CIRCULATION PATTERN IN A ROTATING MODEL OF LAKE ERIE,
W71-05891 02H

STATE UNIV. OF NEW YORK, BUFFALO. GREAT LAKES LAB.
DIRECTORY OF PERSONNEL, WATER RESOURCES, WESTERN NEW YORK.
W71-06150 09A

STATE UNIV., OF NEW YORK, ALBANY. DEPT. OF EARTH AND ATMOSPHERIC SCIENCES.
ON THE MECHANISM OF LANGMUIR CIRCULATIONS AND THEIR ROLE IN EPILIMNION MIXING,
W71-05975 02H

STEARNS-ROGER CORP., DENVER, COLO.
OAK RIDGE NATIONAL LABORATORY VERTICAL TUBE EVAPORATOR PILOT PLANT ANNUAL REPORT FOR FISCAL YEAR 1969.
W71-06243 03A

OAK RIDGE NATIONAL LABORATORY VERTICAL TUBE EVAPORATOR PILOT PLANT - ANNUAL REPORT FOR FISCAL YEAR 1970.
W71-06244 03A

TEL AVIV UNIV. (ISRAEL). DEPT. OF BOTANY.
ENVIRONMENTAL EFFECTS ON WOOD PRODUCTION AND CAMBIAL ACTIVITY IN ZIZIPHUS SPINACHRISTI (L.) WILLD.,
W71-06214 02I

TENNESSEE DEPT. OF PUBLIC HEALTH, NASHVILLE. DIV. OF SANITARY ENGINEERING.
DESIGN CRITERIA FOR MUNICIPAL WASTE WATER TREATMENT PLANTS IN TENNESSEE,
W71-06043 05D

TENNESSEE TECHNOLOGICAL UNIV., COOKEVILLE. DEPT. OF CIVIL ENGINEERING.
DEVELOPMENT OF DESIGN PARAMETERS FOR INTERSTATE REST AREA SEWAGE TREATMENT SYSTEMS,
W71-06040 05D

A STUDY OF MUNICIPAL WASTE WATER RECLAMATION,
W71-06041 05D

TENNESSEE UNIV., KNOXVILLE.
ONE-DIMENSIONAL OPEN CHANNEL HEAT DISPERSION,
W71-06085 05G

TEXAS A AND I UNIV., KINGSVILLE. DEPT. OF ECONOMICS.
IMPROVING WATER RESOURCE ALLOCATION THROUGH DEMAND-ORIENTED WATER POLICY,
W71-06316 06B

TEXAS A AND M UNIV., COLLEGE STATION. WATER RESOURCES INST.
INSTITUTIONAL FACTORS INFLUENCING WATER DEVELOPMENT IN TEXAS,
W71-05972 06B

TEXAS INSTRUMENTS INC., DALLAS.
ION-SELECTIVE ELECTROCHEMICAL SENSORS,
W71-06239 03A

ION-SELECTIVE ELECTROCHEMICAL SENSORS - SECOND REPORT,
W71-06240 03A

TEXAS TECH UNIV., LUBBOCK. WATER RESOURCES CENTER.
INTERBASIN DIVERSION OF WATER AN ANNOTATED BIBLIOGRAPHY,
W71-06071 07C

TEXAS UNIV., AUSTIN.
PROCESS MODELING OF BIOLOGICAL WASTE TREATMENT,
W71-06026 05D

TEXAS UNIV., AUSTIN. CENTER FOR HIGHWAY RESEARCH.
PREDICTION OF MOISTURE MOVEMENT IN EXPANSIVE CLAYS,
W71-06272 02G

TEXAS UNIV., AUSTIN. CENTER FOR RESEARCH IN WATER RESOURCES.
SELECTIVE WITHDRAWAL AT LAKE LIVINGSTON, PRELIMINARY EVALUATIONS, 1969,
W71-06193 05C

TURIN UNIV. (ITALY).
A CRITICAL SURVEY OF USE OF COST-BENEFIT ANALYSIS IN PUBLIC FINANCE,
W71-05948 06C

UNITED STATES LAKE SURVEY, DETROIT, MICH.
VISUAL WAVE OBSERVATIONS ALONG THE LAKE MICHIGAN SHORE,
W71-05899 02H

UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES.
SPECIAL STUDIES OF A SANITARY LANDFILL,
W71-06103 05B

UNIVERSITY OF STRATHCLYDE, GLASGOW (SCOTLAND) AND SALFORD UNIV. (ENGLAND).
ENGINEERING BEHAVIOR AND STRUCTURE OF COMPACTED CLAY,
W71-05908 08D

UNIVERSITY OF STRATHCLYDE, GLASGOW (SCOTLAND). DEPT. OF BIOLOGY.
SOME ASPECTS OF BIOLOGY OF CARCINUS MAENAS (L) II SURVIVAL AT LOW SALINITY,
W71-06179 05C

UNIVERSITY OF WESTERN ONTARIO, LONDON. DEPT. OF ZOOLOGY.
MERCURY USES IN CANADA AND THEIR POSSIBLE HAZARDS AS SOURCES OF MERCURY CONTAMINATION,
W71-05861 05B

UTAH STATE UNIV., LOGAN, DEPT. OF AGRICULTURAL AND IRRIGATION ENGINEERING AND ROBERT S. KERR WATER RESEARCH CENTER, ADA, OKLA.
PROBLEMS OF POLLUTION OF IRRIGATION WATERS IN ARID REGIONS,
W71-06112 05B

UTAH STATE UNIV., LOGAN. DEPT. OF BACTERIOLOGY.
ECOLOGY OF SELECTED BACTERIA IN A SMALL INTERMITTENT SEWAGE POND,
W71-05995 05D

UTAH STATE UNIV., LOGAN. DEPT. OF CIVIL ENGINEERING.
HYDRODYNAMIC EFFECTS OF SEEPAGE ON BED PARTICLES,
W71-05839 02J

UTAH STATE UNIV., LOGAN. DEPT. OF WILDLIFE RESOURCES.
EFFECTS OF ALKYL BENZENE SULFONATE ON RAINBOW TROUT,
W71-06325 05C

UTAH STATE UNIV., LOGAN. ECOLOGY CENTER.
NATURAL POLLUTION IN ARID LAND WATERS,
W71-06113 05B

UTAH WATER RESEARCH LAB., LOGAN.
WATER QUALITY TELEMETRY FINAL PROGRESS REPORT,
W71-06069 05G

WATER RELATED LAND USE IN THE BEAR RIVER DRAINAGE AREA,
W71-06212 07C

WATER RELATED LAND USE IN THE UTAH LAKE DRAINAGE AREA,
W71-06213 07C

HYDROLOGIC INVENTORY OF THE UTAH LAKE DRAINAGE AREA,
W71-06218 02E

HYDROLOGIC INVENTORY OF THE UINTAH STUDY UNIT,
W71-06219 02E

HYDROLOGIC INVENTORY OF THE WEBER RIVER STUDY UNIT,
W71-06220 02E

SIMULATION OF RUNOFF FROM URBAN WATERSHEDS,
W71-06306 04C

UTTAR PRADESH IRRIGATION RESEARCH INST., ROORKEE (INDIA).
EFFICIENCY OF HYDRAULIC JUMP,
W71-05850 08B

VANDERBILT UNIV., NASHVILLE, TENN. DEPT. OF ENVIRONMENTAL AND WATER RESOURCES ENGINEERING.
MOISTURE TRANSPORT IN SLUDGE DEWATERING AND DRYING ON SAND BEDS,
W71-06031 05D

VERMONT UNIV., BURLINGTON. DEPT. OF ZOOLOGY.
LAKE CHAMPLAIN IN RELATION TO REGIONAL WATER SUPPLY,
W71-05875 03B

VICTORIA UNIV., (BRITISH COLUMBIA). DEPT. OF GEOGRAPHY.
WATERFRONT LAND USE IN THE AUSTRALIAN STATE CAPITALS,
W71-06065 06B

VIRGINIA DEPT. OF CONSERVATION AND ECONOMIC DEVELOPMENT, RICHMOND. DIV. OF WATER RESOURCES.
YORK RIVER BASIN COMPREHENSIVE WATER RESOURCES PLAN-VOLUME 1, INTRODUCTION.
W71-06230 06B

YORK RIVER BASIN COMPREHENSIVE WATER RESOURCES PLAN, VOLUME III-HYDROLOGIC ANALYSIS,
W71-06231 06B

VIRGINIA POLYTECHNIC INST., BLACKSBURG.
LACTIC AND PYRUVIC ACID CHANGES IN BLUEGILL SUNFISH (LEPOMIS MACROCHIRUS RAFINESQUE) DURING GRADUAL HYPOXIA AT TWO ACCLIMATION TEMPERATURES (5 AND 20C),
W71-06320 05C

VIRGINIA STATE WATER CONTROL BOARD, RICHMOND.
CONTROL OF WASTES FROM WATER TREATMENT PLANTS,
W71-06200 05D

VIRGINIA UNIV., CHARLOTTESVILLE.
AN INTERFEROMETRIC TECHNIQUE FOR TEMPERATURE AND CONCENTRATION MEASUREMENT FOR AN AIR-WATER INTERFACE,
W71-06090 05A

VSESOYUZNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT GIDROTEKHNIKI I MELIORATSII, YAKUTSK (USSR).
FORMATION OF THE THERMAL REGIME IN SOILS ON IRRIGATED FIELDS IN PERMAFROST REGIONS,
W71-06070 02G

WAIKATO UNIV., HAMILTON (NEW ZEALAND). SCHOOL OF SCIENCE.
THE ORIGIN OF THE LABYRINTH, WRIGHT VALLEY, ANTARCTICA,
W71-05847 02J

WASHINGTON STATE WATER RESEARCH CENTER, PULLMAN.
OPTIMIZATION TECHNIQUES FOR WATER RESOURCE SYSTEMS,
W71-06062 06A

WASHINGTON UNIV., SEATTLE. FISHERIES RESEARCH INST.
SIMULATION OF A WATER RESOURCE SYSTEM, FINAL REPORT,
W71-06066 05G

WASHINGTON UNIV., ST. LOUIS, MO.
INSTITUTIONAL OBSTACLES TO REALLOCATING GOVERNMENT EXPENDITURES,
W71-05961 06B

WATERLOO UNIV. (ONTARIO). DEPT. OF MECHANICAL ENGINEERING.
INTERNAL WAVES OF THE SECOND VERTICAL MODE IN LAKE HURON,
W71-05896 02H

WESTERN SCIENTIFIC SERVICES, INC., FORT COLLINS, COLO.
THE SURFACE INSTRUMENT NETWORK OF THE UPPER COLORADO RIVER PILOT PROJECT,
W71-06136 07A

WESTINGHOUSE ELECTRIC CORP., EAST PITTSBURGH, PA.
TRANSMISSION IN THE 70'S,
W71-05912 08C

WINONA STATE COLL., MINN.
MAYFLY DISTRIBUTION AS A WATER QUALITY INDEX,
W71-06248 05A

WISCONSIN STATE UNIV., SUPERIOR. CENTER FOR LAKE SUPERIOR ENVIRONMENTAL STUDIES.
REPORT ON BIOLOGICAL, CHEMICAL, AND GEOLOGICAL STUDIES OF BOIS BRULE AND POPLAR RIVER WATERSHEDS,
W71-05986 05C

WISCONSIN STATE UNIV., SUPERIOR. DEPT OF BIOLOGY.
THE UPLAND FOREST VEGETATION OF THE BOIS BRULE RIVER BASIN, TRIBUTARY TO LAKE SUPERIOR,
W71-05987 02J

WISCONSIN UNIV., MADISON.
COLLECTIVE ACTION AND THE DISTRIBUTION OF INCOME A CONCEPTUAL APPROACH,
W71-05960 06C

WISCONSIN UNIV., MADISON. DEPT. OF SANITARY ENGINEERING, AND WISCONSIN UNIV., MADISON. DEPT. OF WATER CHEMISTRY.
EFFECTS OF AGRICULTURAL POLLUTION ON EUTROPHICATION,
W71-06443 05C

WISCONSIN UNIV., MADISON. MARINE STUDIES CENTER.
SUMMER THERMAL STRUCTURE AND CIRCULATION OF CHEQUAMEGON BAY, LAKE SUPERIOR--A FLUCTUATING SYSTEM,
W71-05885 02H

WISCONSIN UNIV., MADISON. SCHOOL OF LAW.
WATER-USE LAW AND ADMINISTRATION IN WISCONSIN,
W71-06192 06E

WISCONSIN UNIV., MADISON. WATER CHEMISTRY LAB.
WATER CHEMISTRY OF TOXAPHENE - ROLE OF LAKE SEDIMENTS,
W71-05840 05B

WISCONSIN UNIV., MADISON. WATER RESOURCES CENTER AND WISCONSIN UNIV., MADISON. DEPT. OF CIVIL ENGINEERING.
SEEPAGE FACE EFFECTS IN UNSTEADY GROUNDWATER FLOW,
W71-06190 02F

WISCONSIN UNIV., MADISON. WATER RESOURCES CENTER.
PHYSICAL PROPERTIES AND PROCESSING CHARACTERISTICS OF MACROPHYTES AS RELATED TO MECHANICAL HARVESTING,
W71-06188 04A

ALGICIDES,
W71-06189 05C

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
SEDIMENTS OF THE NORTHERN MIDDLE AMERICA TRENCH,
W71-05844 02J

YORK UNIV. (ENGLAND).
QUANTITATIVE ANALYSIS IN PUBLIC FINANCE,
W71-05947 06A

THE FISCAL ECONOMIST AND QUANTITATIVE ANALYSIS,
W71-05956 06C

MEASURING EFFICIENCY IN GOVERNMENT SERVICES,
W71-05957 06B

ZOOLOGICAL SOCIETY OF SAN DIEGO, CALIF. HEALTH DEPT.
EFFECTS OF OIL POLLUTION ON WATERFOWL A STUDY OF SALVAGE METHODS,
W71-05983 05C

ACCESSION NUMBER INDEX

06E	W71-05836	02E	W71-05909	05C	W71-05982	05G	W71-06055
05A	W71-05837	08D	W71-05910	05C	W71-05983	03F	W71-06056
02F	W71-05838	06E	W71-05911	05C	W71-05984	02I	W71-06057
02J	W71-05839	08C	W71-05912	02I	W71-05985	07B	W71-06058
05B	W71-05840	08C	W71-05913	05C	W71-05986	03F	W71-06059
05D	W71-05841	08C	W71-05914	02J	W71-05987	03F	W71-06060
05A	W71-05842	08D	W71-05915	02L	W71-05988	06B	W71-06061
03D	W71-05843	07B	W71-05916	02K	W71-05989	06A	W71-06062
02J	W71-05844	08E	W71-05917	05D	W71-05990	03F	W71-06063
02J	W71-05845	06A	W71-05918	05C	W71-05991	02I	W71-06064
02H	W71-05846	08D	W71-05919	02I	W71-05992	06B	W71-06065
02J	W71-05847	02F	W71-05920	02K	W71-05993	05G	W71-06066
02J	W71-05848	06B	W71-05921	06E	W71-05994	03F	W71-06067
08B	W71-05849	06A	W71-05922	05D	W71-05995	03F	W71-06068
08B	W71-05850	03F	W71-05923	05B	W71-05996	05G	W71-06069
02B	W71-05851	05B	W71-05924	06E	W71-05997	02G	W71-06070
02E	W71-05852	05D	W71-05925	06E	W71-05998	07C	W71-06071
04B	W71-05853	05D	W71-05926	02I	W71-05999	03F	W71-06072
02K	W71-05854	05D	W71-05927	05G	W71-06000	02I	W71-06073
07C	W71-05855	06G	W71-05928	05C	W71-06001	02I	W71-06074
02J	W71-05856	08B	W71-05929	07B	W71-06002	05C	W71-06075
02J	W71-05857	05D	W71-05930	05C	W71-06003	05C	W71-06076
02J	W71-05858	08A	W71-05931	02I	W71-06004	05B	W71-06077
02J	W71-05859	08A	W71-05932	05A	W71-06005	05A	W71-06078
02J	W71-05860	08A	W71-05933	05E	W71-06006	05A	W71-06079
05B	W71-05861	05B	W71-05934	06E	W71-06007	05C	W71-06080
04B	W71-05862	06B	W71-05935	02H	W71-06008	05C	W71-06081
08B	W71-05863	06F	W71-05936	05C	W71-06009	05C	W71-06082
06B	W71-05864	06B	W71-05937	02J	W71-06010	05C	W71-06083
06B	W71-05865	06B	W71-05938	02I	W71-06011	05C	W71-06084
02K	W71-05866	06A	W71-05939	02L	W71-06012	05G	W71-06085
04A	W71-05867	06B	W71-05940	02L	W71-06013	06E	W71-06086
04A	W71-05868	06B	W71-05941	02L	W71-06014	06E	W71-06087
07C	W71-05869	06D	W71-05942	02L	W71-06015	02H	W71-06088
02F	W71-05870	06E	W71-05943	02L	W71-06016	06E	W71-06089
02H	W71-05871	06B	W71-05944	02L	W71-06017	05A	W71-06090
05B	W71-05872	06B	W71-05945	02L	W71-06018	05G	W71-06091
02L	W71-05873	04A	W71-05946	02L	W71-06019	05C	W71-06092
02K	W71-05874	06A	W71-05947	02L	W71-06020	05C	W71-06093
03B	W71-05875	06C	W71-05948	02L	W71-06021	02L	W71-06094
06E	W71-05876	06B	W71-05949	02L	W71-06022	05B	W71-06095
02L	W71-05877	06B	W71-05950	02L	W71-06023	05C	W71-06096
05G	W71-05878	05G	W71-05951	05D	W71-06024	05C	W71-06097
05A	W71-05879	06E	W71-05952	05D	W71-06025	06E	W71-06098
05A	W71-05880	06B	W71-05953	05D	W71-06026	06E	W71-06099
05A	W71-05881	06B	W71-05954	05D	W71-06027	05A	W71-06100
05B	W71-05882	06B	W71-05955	05D	W71-06028	05B	W71-06101
05A	W71-05883	06C	W71-05956	05D	W71-06029	04A	W71-06102
02H	W71-05884	06B	W71-05957	05D	W71-06030	05B	W71-06103
02H	W71-05885	06E	W71-05958	05D	W71-06031	05A	W71-06104
07B	W71-05886	06B	W71-05959	05D	W71-06032	06B	W71-06105
07B	W71-05887	06C	W71-05960	05D	W71-06033	05G	W71-06106
02H	W71-05888	06B	W71-05961	05D	W71-06034	05D	W71-06107
02J	W71-05889	06B	W71-05962	05D	W71-06035	05F	W71-06108
02J	W71-05890	06B	W71-05963	05D	W71-06036	04A	W71-06109
02H	W71-05891	06B	W71-05964	05D	W71-06037	02L	W71-06110
02D	W71-05892	06B	W71-05965	05D	W71-06038	05G	W71-06111
02H	W71-05893	06C	W71-05966	05C	W71-06039	05B	W71-06112
02H	W71-05894	06E	W71-05967	05D	W71-06040	05B	W71-06113
02H	W71-05895	06B	W71-05968	05D	W71-06041	05B	W71-06114
02H	W71-05896	06C	W71-05969	05D	W71-06042	02B	W71-06115
02H	W71-05897	06D	W71-05970	05D	W71-06043	06B	W71-06116
07B	W71-05898	05B	W71-05971	05D	W71-06044	04B	W71-06117
02H	W71-05899	06B	W71-05972	06G	W71-06045	04B	W71-06118
02H	W71-05900	06D	W71-05973	06E	W71-06046	04A	W71-06119
07B	W71-05901	05C	W71-05974	05G	W71-06047	02F	W71-06120
07C	W71-05902	02H	W71-05975	05G	W71-06048	01A	W71-06121
02E	W71-05903	06E	W71-05976	06E	W71-06049	02F	W71-06122
02E	W71-05904	06E	W71-05977	06E	W71-06050	07C	W71-06123
08B	W71-05905	02H	W71-05978	05G	W71-06051	03C	W71-06124
07C	W71-05906	06E	W71-05979	05G	W71-06052	02A	W71-06125
08D	W71-05907	06E	W71-05980	05G	W71-06053	06B	W71-06126
08D	W71-05908	05A	W71-05981	05G	W71-06054	07C	W71-06127

07A	W71-06128	05C	W71-06205	05G	W71-06282	05G	W71-06359
04C	W71-06129	05B	W71-06206	06E	W71-06283	08G	W71-06360
05B	W71-06130	05C	W71-06207	06A	W71-06284	05G	W71-06361
04A	W71-06131	05B	W71-06208	08A	W71-06285	08F	W71-06362
03B	W71-06132	05B	W71-06209	08G	W71-06286	05G	W71-06363
02C	W71-06133	05E	W71-06210	08C	W71-06287	05G	W71-06364
02C	W71-06134	05C	W71-06211	08A	W71-06288	05G	W71-06365
02C	W71-06135	07C	W71-06212	08A	W71-06289	05D	W71-06366
07A	W71-06136	07C	W71-06213	05G	W71-06290	05G	W71-06367
02C	W71-06137	02I	W71-06214	08G	W71-06291	08A	W71-06368
07C	W71-06138	03F	W71-06215	08F	W71-06292	08A	W71-06369
02C	W71-06139	03F	W71-06216	08B	W71-06293	05G	W71-06370
02C	W71-06140	03F	W71-06217	08F	W71-06294	05D	W71-06371
02C	W71-06141	02E	W71-06218	05B	W71-06295	05G	W71-06372
02C	W71-06142	02E	W71-06219	06E	W71-06296	08B	W71-06373
08A	W71-06143	02E	W71-06220	05G	W71-06297	05D	W71-06374
04A	W71-06144	03C	W71-06221	07C	W71-06298	08B	W71-06375
06E	W71-06145	05G	W71-06222	08A	W71-06299	08A	W71-06376
07C	W71-06146	04D	W71-06223	08G	W71-06300	05D	W71-06377
02A	W71-06147	03F	W71-06224	08G	W71-06301	08C	W71-06378
07A	W71-06148	04D	W71-06225	08A	W71-06302	05G	W71-06379
07A	W71-06149	06E	W71-06226	06E	W71-06303	04D	W71-06380
09A	W71-06150	06B	W71-06227	06E	W71-06304	05G	W71-06381
08B	W71-06151	07C	W71-06228	06E	W71-06305	08B	W71-06382
03F	W71-06152	04B	W71-06229	04C	W71-06306	08F	W71-06383
08H	W71-06153	06B	W71-06230	06A	W71-06307	05G	W71-06384
03B	W71-06154	06B	W71-06231	06E	W71-06308	08A	W71-06385
02E	W71-06155	04A	W71-06232	06B	W71-06309	05F	W71-06386
05A	W71-06156	03A	W71-06233	06B	W71-06310	08C	W71-06387
05A	W71-06157	08G	W71-06234	06A	W71-06311	05D	W71-06388
05A	W71-06158	08G	W71-06235	06B	W71-06312	05D	W71-06389
02K	W71-06159	03A	W71-06236	06B	W71-06313	08B	W71-06390
07C	W71-06160	03A	W71-06237	06B	W71-06314	08B	W71-06391
06E	W71-06161	03A	W71-06238	06B	W71-06315	08A	W71-06392
06E	W71-06162	03A	W71-06239	06B	W71-06316	08B	W71-06393
06E	W71-06163	03A	W71-06240	06F	W71-06317	08B	W71-06394
06E	W71-06164	03A	W71-06241	06D	W71-06318	08B	W71-06395
02H	W71-06165	03A	W71-06242	06D	W71-06319	05G	W71-06396
02K	W71-06166	03A	W71-06243	05C	W71-06320	04A	W71-06397
02K	W71-06167	03A	W71-06244	05C	W71-06321	08B	W71-06398
02F	W71-06168	05G	W71-06245	05C	W71-06322	08B	W71-06399
02J	W71-06169	05D	W71-06246	05C	W71-06323	08B	W71-06400
06E	W71-06170	05G	W71-06247	05C	W71-06324	08B	W71-06401
06E	W71-06171	05A	W71-06248	05C	W71-06325	08B	W71-06402
06E	W71-06172	05G	W71-06249	08B	W71-06326	08A	W71-06403
06E	W71-06173	04D	W71-06250	05C	W71-06327	08B	W71-06404
02H	W71-06174	05G	W71-06251	05A	W71-06328	08B	W71-06405
02F	W71-06175	05E	W71-06252	08C	W71-06329	08G	W71-06406
05B	W71-06176	04C	W71-06253	02H	W71-06330	08F	W71-06407
06E	W71-06177	04C	W71-06254	05G	W71-06331	08G	W71-06408
06E	W71-06178	04C	W71-06255	05G	W71-06332	05G	W71-06409
05C	W71-06179	05G	W71-06256	05D	W71-06333	02B	W71-06410
05C	W71-06180	05D	W71-06257	08C	W71-06334	08E	W71-06411
05C	W71-06181	05B	W71-06258	08C	W71-06335	08A	W71-06412
05C	W71-06182	05E	W71-06259	08A	W71-06336	08F	W71-06413
06E	W71-06183	05C	W71-06260	08A	W71-06337	05D	W71-06414
05C	W71-06184	05A	W71-06261	08G	W71-06338	05D	W71-06415
05C	W71-06185	05C	W71-06262	08G	W71-06339	08A	W71-06416
05G	W71-06186	04B	W71-06263	08F	W71-06340	08A	W71-06417
05B	W71-06187	02G	W71-06264	05G	W71-06341	05G	W71-06418
04A	W71-06188	05D	W71-06265	08A	W71-06342	08G	W71-06419
05C	W71-06189	04B	W71-06266	08A	W71-06343	08G	W71-06420
02F	W71-06190	05D	W71-06267	05G	W71-06344	08G	W71-06421
05G	W71-06191	05D	W71-06268	08A	W71-06345	08A	W71-06422
06E	W71-06192	05B	W71-06269	08A	W71-06346	05G	W71-06423
05C	W71-06193	05B	W71-06270	05D	W71-06347	08G	W71-06424
05D	W71-06194	05D	W71-06271	08A	W71-06348	04D	W71-06425
06E	W71-06195	02G	W71-06272	08G	W71-06349	08G	W71-06426
05D	W71-06196	06E	W71-06273	08G	W71-06350	07B	W71-06427
05D	W71-06197	06E	W71-06274	05G	W71-06351	08B	W71-06428
05D	W71-06198	05G	W71-06275	05G	W71-06352	05G	W71-06429
05D	W71-06199	06E	W71-06276	08F	W71-06353	05B	W71-06430
05D	W71-06200	06E	W71-06277	08C	W71-06354	05B	W71-06431
05D	W71-06201	06E	W71-06278	08G	W71-06355	05G	W71-06432
05C	W71-06202	06E	W71-06279	08A	W71-06356	05B	W71-06433
05C	W71-06203	06E	W71-06280	05G	W71-06357	05B	W71-06434
05C	W71-06204	06E	W71-06281	08C	W71-06358	05B	W71-06435

05B	W71-06436	05G	W71-06441	05G	W71-06446	05B	W71-06451
05G	W71-06437	05D	W71-06442	05G	W71-06447	05D	W71-06452
05C	W71-06438	05C	W71-06443	05G	W71-06448	05D	W71-06453
05B	W71-06439	05C	W71-06444	05G	W71-06449	05D	W71-06454
05B	W71-06440	05D	W71-06445	05D	W71-06450	05C	W71-06455

ABSTRACT SOURCES

Source	Accession Number	Total
A. Center of Competence		
University of Arizona, Arid Land Water Resources	W71-06056--06074 06212--06226	34
U.S. Geological Survey, Hydrology	W71-05837--05875 05877--05904 06111--06144 06146--06160 06165--06169 06174--06176 06227--06232 05973--05975 05978	134
University of Wisconsin, Eutrophication	W71-05984--05993 05995--05996 05998--06006 06008--06023	35
Univeristy of Texas, Wastewater Treatment and Management	W71-06024--06044 06193--06194 06196--06201	29
Vanderbilt University, Thermal Pollution	W71-06075--06085 06090--06098 06088, 06100	22
Rutgers--The State University, Water Resources Economics	W71-05935--05951 05953--05957 05959--05966 05968--05970 06318--06319 06191, 06266 05921	38
Iowa State University, Agricultural Livestock Wastes	W71-06429--06455	27
Bureau of Reclamation, Engineering Works	W71-05905--05910 05912--05919	14
University of Washington, Water Quality Requirements for Aquatic Organisms	W71-06179--06182 06183--06185 06320--06325 06327	13
Oceanic Research Institute, Coastal Pollution	W71-06202--06211	10
University of Chicago, Metropolitan Water Resources Management	W71-06306--06317	12
University of Florida, Eastern U.S. Water Law	W71-06045--06055 06273--06284 05836, 05876 05911, 05976 05977, 05998 06098, 05952 05958, 05967 05979, 05980	60

ABSTRACT SOURCES

Source	Accession Number	Total
A. Center of Competence (Cont'd)		
University of Florida, Eastern U.S. Water Law (Cont'd)	W71-05984, 05994 05997, 06007 06086, 06087 06089, 06099 06145, 06296 06161--06164 06170--06173 06177, 06178 06183, 06195 06303--06305	
B. State Water Resources Research Institute		
Ohio Water Resources Center	W71-05920, 06187	2
Illinois Water Resources Center	W71-05922--05923	2
Arkansas Water Resources Research Center	W71-05971	1
Texas Water Resources	W71-05972	1
Kansas Water Resources Research Institute	W71-06186	1
Wisconsin Water Resources Center	W71-06187--06190 06191	5
Hawaii Water Resources Research Center	W71-06263	1
Oklahoma Water Resources Research Institute	W71-06264	1
Missouri Water Resources Research Center	W71-06265	1
C. Other		
Environmental Protection Agency, Water Quality Office	W71-06245--06262 05981--05983 06328	22
Engineering Aspects of Urban Water Resources (Poertner)	W71-05924--05934	11
Office of Saline Water	W71-06233--06244	12

☆ U.S. GOVERNMENT PRINTING OFFICE : 1971 O-LT - 432-321 (21)

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Research Institute of Rutgers University.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the EPA-Water Quality Office, Soap and Detergent Association, and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Textile wastes pollution at the School of Textiles of North Carolina State University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Water Quality Office of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.

Subject Fields

- NATURE OF WATER
- WATER CYCLE
- WATER SUPPLY AUGMENTATION AND CONSERVATION
- WATER QUANTITY MANAGEMENT AND CONTROL
- WATER QUALITY MANAGEMENT AND PROTECTION
- WATER RESOURCES PLANNING
- RESOURCES DATA
- ENGINEERING WORKS
- MANPOWER, GRANTS, AND FACILITIES
- SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

- SUBJECT INDEX
- AUTHOR INDEX
- ORGANIZATIONAL INDEX
- ACCESSION NUMBER INDEX
- ABSTRACT SOURCES

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE

U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL INFORMATION SERVICE
Springfield, Va. 22151

OFFICIAL BUSINESS
PRINTED MATTER

SERIALS SECTION
UNIVERSITY OF ILLINOIS LIBRARY
CHICAGO CIRCLE
~~VIA COURIER~~
Chicago, Ill. 60637